

THE BROMELIACEAE OF BOLIVIA

LYMAN B. SMITH

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2. *Fosterella* L. B. Smith

Terrestrial, ombrophilous, stemless. Leaves rosulate, entire or serrulate, the blades more or less narrowed toward base. Scape erect, elongate. Inflorescence usually laxly paniculate, often tripinnate. Flowers small, homomorphic, perfect. Sepals free. Petals free, naked much exceeding the sepals, usually white. Stamens of the inner series very short-adnate to the base of the petals, the anthers linear, basifixed, the pollen dry, wind-borne. Ovary wholly superior, glabrous, the placentae elongate, the style very slender. Capsule septicidal or loculicidal. Seeds bicaudate.

- a. Flowers neither secund nor nutant; inflorescence amply tripinnate.
 - b. Stamens longer than the petals; leaf-blades 8 mm. wide. 1. *F. Pearcei*.
 - b. Stamens shorter than the petals; leaf-blades 20-30 mm. wide, serrulate toward base. 2. *F. albicans*.
- a. Flowers secund or nutant, usually both.
 - c. Leaf-blades serrulate, at least toward base.
 - d. Leaf-blades serrulate for most of their length, pungent; scape-bracts serrulate; flowers 5 mm. long. 3. *F. Weddelliana*.
 - d. Leaf-blades serrulate only toward base, filiform-acuminate; scape-bracts entire; flowers 3 mm. long.
 - e. Scape-bracts bladeless; leaf-blades flat, uniform. 4. *F. Rusbyi*.
 - e. Scape-bracts with large foliaceous blades; leaf-blades channeled. 5. *F. graminea*.
 - c. Leaf-blades entire.
 - f. Inflorescence densely villous; floral bracts more than twice as long as the pedicels, acuminate. 6. *F. villosula*.
 - f. Inflorescence glabrous; floral bracts merely acute, mostly shorter than the pedicels.
 - g. Flowers 5 mm. long; sepals subtriangular. 7. *F. schidosperma*.
 - g. Flowers 8-9 mm. long.
 - h. Sepals obtuse; leaves to 25 cm. long. 8. *F. penduliflora*.
 - h. Sepals acute; leaves about 15 cm. long. 9. *F. gracilis*.

1. *Fosterella Pearcei* (Baker) L. B. Smith in *Phytologia*, 7: 172 (1960). *Lindmania Pearcei* (Baker) Mez of Catalogue. Flowering to 5 dm. high. Leaf-blades linear, narrowed toward base, caudate-

attenuate, 8 mm. wide, channeled, covered beneath with pale appressed scales, glabrous above. Scape erect. Scape-bracts strict, densely imbricate, subfoliaceous. Inflorescence laxly tripinnate, subthyrsoid, attenuate, 4 dm. long, arachnoid. Primary bracts linear-triangular, attenuate, shorter than the sterile bases of the branches. Branches ascending, lax. Floral bracts triangular-ovate, exceeding the pedicels, the upper 3.5 mm. long. Flowers erect or suberect, not notably secund, 3.5 mm. long. Sepals semiorbicular, broadly rounded, 2 mm. long. Petals slightly exceeding the sepals. Stamens exserted, the anthers 2 mm. long. DEPARTMENT UNKNOWN: Butuco, 1865, *Pearce* s. n. (BM; type). LA PAZ: SUR YUNGAS: Basin of Rio Bopi, San Bartolome near Calisaya, 750-900 m., *Krukoff* 10328 (GH, NY).

2. **F. albicans** (Griseb.) L. B. Smith in *Phytologia* 7: 171 (1960). Flowering 8-10 dm. high. Leaf-blades linear, soft-acuminate, narrowed and serrulate toward base, 20-30 mm. wide, cinereous-lepidote especially beneath. Scape erect, 7 mm. in diameter. Scape-bracts subfoliaceous, much exceeding the internodes, entire. Inflorescence tripinnate, thyrsoid, to 4 dm. long, pale-lepidote. Primary bracts narrowly triangular, shorter than the branches. Branches divergent, subdensely 10-20-flowered. Floral bracts broadly ovate, acuminate, 4-5 mm. long, slightly exceeded by the sepals. Pedicels 1.5 mm. long. Flowers spreading, not secund. Sepals ovate, subobtuse, 4 mm. long. Petals 5.5 mm. long. COCHABAMBA: CHAPARE: Sacaba, *Steinbach* 5699 (LIL). Argentina.

3. **F. Weddelliana** (Brongn. ex. Baker) L. B. Smith in *Phytologia*, 7: 172 (1960). *Lindmania Weddelliana* (Brongn.) Mez of Catalogue. Flowering 5 dm high. Leaf-blades ligulate, narrowed to a pungent apex, somewhat constricted at base, ca. 16 cm. long, 20 mm. wide, serrate at least at base with spines 0.5 mm. long, brown-lepidote especially beneath. Scape slender, glabrous. Scape-bracts imbricate, serrulate. Inflorescence laxly tripinnate, 20 cm. long, glabrous. Primary bracts narrowly triangular, caudate-attenuate, much shorter than the branches. Branches erect, very slender, sublaxly 15-30-flowered. Floral bracts suberect, broadly elliptic, short-acuminate, hyaline, the upper 2 mm. long. Pedicels slender, exceeding the floral bracts. Flowers secund, nutant, 5 mm. long. Sepals ovate-elliptic, broadly rounded, 2 mm. long. Petals white, exceeding the stamens. LA PAZ: Yungas, *Weddell* 4233 (P; type).

4. **F. Rusbyi** (Mez) L. B. Smith in *Phytologia*, 7: 172 (1960). *Lindmania Rusbyi* Mez of Catalogue. Flowering 5 dm. high. Leaf-blades linear, attenuate to a soft filiform apex, slightly narrowed toward base, 2 dm. long, somewhat dimorphic with broad and narrow forms, to 25 mm. wide, chartaceous-membranaceous, sparsely serrulate at base, pale green and glabrate above, covered beneath with a

membrane of whitish scales. Scape erect, slender, glabrous. Scape-bracts lanceolate, filiform-attenuate, longer or shorter than the internodes, entire. Inflorescence laxly 2-3-pinnate, 3 dm. long, the axes glabrous. Primary bracts like the scape-bracts, much shorter than the branches. Branches curved-ascending, elongate very slender, laxly 8-15-flowered. Floral bracts broadly ovate, acute, minute, membranaceous. Flowers nutant, secund 3 mm. long. Sepals ovate-elliptic, rounded, 1.5 mm. long. Petals greenish. Stamens included. LA PAZ: Yungas, *Bang* 2571 (B; type; BM, F, G, GH, K, NY, US); NOR YUNGAS: Polo-Polo, Coroico, 1100 m., *Buchtien* 3674 (NY, US); Miliguaya, 1300 m., *Buchtien* 4285 (US). Peru.

5. *F. graminea* (L. B. Smith) L. B. Smith in *Phytologia*, 7: 171 (1960). *Lindmania graminea* L. B. Smith of Catalogue. Flowering over 1 m. high. Leaf-blades linear, filiform-attenuate, contracted at base but not really petiolate, 6 dm. long, 12 mm. wide, strongly channeled, subdensely serrate toward base with spines 1 mm. long, glabrous above, covered beneath with a membrane of white scales. Scape erect, elongate, slightly flexuous, 5 mm. in diameter, glabrous. Scape-bracts very large but spreading and not concealing the scape, entire, the lowest foliaceous with small sheaths, the highest filiform-attenuate from a very narrowly triangular base. Inflorescence laxly and very amply tripinnate, over 6 dm. long, glabrous. Lowest primary bracts like the top scape-bracts, large but shorter than the branches, the highest greatly reduced. Branches curved upward, laxly secund-flowered. Floral bracts broadly elliptic, less than half as long as the pedicels. Pedicels slender, 2 mm. long. Sepals elliptic, obtuse, 1.5 mm. long. Petals 3 mm. long, equaling the stamens, white. LA PAZ: LARECAJA: Mapiri, San Carlos, 700 m., *Buchtien* 417 (US; type).

6. *F. villosula* (Harms) L. B. Smith in *Phytologia*, 7: 172 (1960). *Lindmania villosula* Harms of Catalogue. Propagating by basal offshoots, flowering over 6 dm. high. Leaves few, rosulate, 2-3 dm. long, entire, membranaceous, the blades linear-lanceolate, attenuate, narrowed toward base, 25-40 mm. wide, sparsely flocculose beneath, glabrous above. Scape erect, flocculose. Scape-bracts densely imbricate, linear-lanceolate, attenuate, 3-5 cm. long, thin. Inflorescence laxly subtripinnate, subcylindric, 25 cm. long, many-flowered, flocculose-villous. Primary bracts like the scape-bracts, 2-4 cm. long. Branches curved-ascending, subdense. Floral bracts lance-ovate, attenuate, nearly 7 mm. long. Pedicels very short. Flowers nutant, secund. Sepals oblong-ovate, subacute, 4-5 mm. long. Petals broadly oblanceolate, subobtuse, 7 mm. long. Stamens included. LA PAZ: SUR YUNGAS [?]: Beni River Valley, 1000 m., *Rusby* 393 (NY); COCHABAMBA: CHAPARE: Incachaca to San Antonio, 1600 m., *Werdermann* 2120 (B; type).

7. **F. schidosperma** (Baker) L. B. Smith in *Phytologia*, 8: 500 (1963). *Cottendorfia Rusbyi* Baker in Bull. Torr. Bot. Club, 29: 697 (1902). *Lindmania Weberbaueri* Mez of Catalogue. Flowering 9 dm. high. Leaf-blades broadly lanceolate, attenuate, narrowed toward base, 25 cm. long, 4 cm. wide, entire, membranaceous, glabrous. Scape erect, slender, glabrous. Scape-bracts ovate, attenuate, shorter than the internodes, entire. Inflorescence laxly bipinnate, 3 dm. long, 75 mm. wide, many-flowered, glabrous. Primary bracts like the scape-bracts, many times shorter than the branches. Branches curved-ascending, 8 cm. long, lax. Floral bracts ovate, acute, 1.5 mm. long, shorter than the pedicels, erect. Flowers nutant, rather obscurely secund, 5 mm. long. Sepals subtriangular, obtuse, 2.5 mm. long. Petals subelliptic, acute, erect at anthesis. Stamens included. LA PAZ: Yungas, 2000 m., *Rusby* 2541 (NY; type of *Cottendorfia Rusbyi* Baker; US); SUR YUNGAS: Rio Bopi Basin, San Bartolome, Calisaya, 750-900 m., *Krukoff* 10482 (GH, US). Peru.

8. **F. penduliflora** (C. H. Wright) L. B. Smith in *Phytologia*, 7: 172 (1960). *Lindmania penduliflora* (C. H. Wright) Stapf of Catalogue. Flowering 25-60 cm. high, propagating by suckers. Leaf-blades linear-lanceolate with a soft narrow apex, 35 cm. long, 35 mm. wide, thin, glabrous above, sparingly scurfy beneath. Scape slender, glabrous. Scape-bracts lanceolate, attenuate, entire, the upper remote. Inflorescence laxly paniculate, 2 dm. long, glabrous. Primary bracts like the upper scape-bracts, 5-10 mm. long, hyaline. Branches simple or the lowest divided and 2 dm. long, laxly many-flowered. Floral bracts ovate, acuminate, 1-1.5 mm. long, thin, green. Pedicels slender, 2, rarely 3, mm. long. Sepals lanceolate, obtuse, 3.5 mm. long, green with white margins. Petals lance-oblong, 8-9 mm. long, over 2 mm. wide, white. Stamens included. SANTA CRUZ: CORDILLERA: Lagunillas, Cordillera of Cara, 1200 m., *Cárdenas* 2856 (GH); CHIQUITOS: Robore, 416 m., *Cárdenas* 2994 (GH). Peru, Argentina.

9. **F. gracilis** (Rusby) L. B. Smith in *Phytologia*, 7: 171 (1960). *Catopsis gracilis* Rusby in Bull. N. Y. Bot. Gard. 6: 489 (1910). *Lindmania gracilis* (Rusby) L. B. Smith of Catalogue. Flowering 30-45 cm. high. Leaves few, 15 cm. long, entire, the outer ones white-tomentose-lepidote, the blades linear-lanceolate, attenuate, narrowed toward base, 11 mm. wide. Scape erect, slender. Scape-bracts narrowly triangular, attenuate, much shorter than the internodes. Inflorescence laxly bipinnate or subtripinnate. Primary bracts like the scape-bracts, shorter than the sterile bases of the branches. Branches curved-ascending, very slender, sublaxly many-flowered. Floral bracts ovate, acute, shorter than the pedicels. Pedicels slender, 3 mm. long. Flowers nutant, secund. Sepals ovate, acute, 2 mm. long. Petals lanceolate, 5-6 mm. long, equaling the stamens. LA PAZ: SUR YUNGAS:

Guanai, 500 m., *R. S. Williams* 738 (NY; type); Santa Ana, Bopi, 500 m., *White* 1086 (NY).

3. *Deuterocohnia* Mez

Spreading shrubs. Leaves many, densely rosulate, the blades narrowly triangular, usually spinose-serrate. Scape woody with a distinct cambium layer. Inflorescence perennial, putting forth new branches from buds on the axis every year, 2-4-pinnate. Branches polystichous-flowered, surrounded by buds at the base. Flowers sessile or very short-pedicellate. Sepals free. Petals free, actinomorphic, erect, much exceeding the sepals, bearing a single large incised scale at the base. Stamens free, the anthers linear, dorsifixed, the pollen sulcate. Ovary superior, glabrous, the placentae linear. Ovules numerous, bearing a narrow dorsal wing that is more or less produced at the apex. Capsule septicidal to the base. Seeds winged.

Branches of the inflorescence laxly flowered, the rhachis almost wholly exposed. 1. *D. longipetala*.
Branches of the inflorescence strobilate, the rhachis completely covered. 2. *D. strobilifera*.

1. *Deuterocohnia longipetala* (Baker) Mez in Mart. Fl. Bras. 3(3): 506 (1894). Flowering 8-10 dm. high. Leaf-blades 3-4 dm. long, attenuate to a slender caudate entire apex, covered with white transparent scales and beneath with cinereous opaque ones, densely serrate with spines 3-4 mm. long. Scape 5-6 mm. in diameter, glabrous. Scape-bracts linear-triangular, serrate, the upper shorter than the internodes. Inflorescence laxly paniculate, many-flowered, the axes subferruginous-tomentellous or glabrous. Primary bracts minute, about equaling the buds. Branches spreading, slender, simple or compound, 10-20 cm. long. Floral bracts very broadly ovate, apiculate, 4 mm. long. Flowers erect, sessile, 17-25 mm. long. Sepals strongly asymmetric, ovate, obliquely truncate, 8-10 mm. long, few-nerved. Petals yellow with a green spot at apex, equaling or exceeding the stamens. Anthers 4-6 mm. long, green. SANTA CRUZ: CERCADO [?]: Sierra de Santa Cruz, 2000 m., *Kuntze* s. n. (NY); Comarapa to Vallegrande, 2100 m., *Cárdenas* 4007 (US); CORDILLERA: Tareira, Lagunillas, 1000 m., *Cárdenas* 2850 (GH). Peru, Argentina.

2. *D. strobilifera* Mez in Fedde, Repert. Spec. Nov. 3: 15 (1906). Forming loose polsters, the flowering shoot 15-20 cm. high. Leaf-blades 10-20 cm. long, 18 mm. wide, covered with a whitish or silvery coat of scales, laxly serrate in the typical variety with curved subspreading spines 5 mm. long. Scape 6-15 cm. long. Scape-bracts foliaceous, exceeding the internodes. Inflorescence laxly bipinnate from a few branches. Spikes sessile, ellipsoid, obtuse, strobilate, 3-5 cm. long, 18 mm. in diameter. Floral bracts ovate, acute, 7 mm. long, about equaling the sepals. Flowers sessile or subsessile, very

variable in size, glabrous. Sepals broadly elliptic, somewhat asymmetric, 6-9 mm. long, mucronulate. Petals elliptic-oblong, 15 mm. long, yellow, the basal scale more or less bifurcate. Stamens equaling or exceeding the petals. CHUQUISACA: SUR CINTI: Camataquí, 2500 m., *Fiebrig* 2933 (B; type). Argentina.

2a. *D. strobilifera* var. *inermis* L. B. Smith in *Contrib. U. S. Nat. Herb.* 29: 535 (1954). Leaf-blades entire. POTOSÍ: SUR CHICHAS: Oploca to Atocha, 3000 m., *Cárdenas* 3741 (GH, US). CHUQUISACA: CINTI: Sivingamayu, 3400 m., *Cárdenas* 4094 (US; type). TARIJA: CERCADO: Villazón to Tarija, 3400 m., *West* 8379 (GH). Argentina.

4. *Abromeitiella* Mez

Abromeitiella brevifolia (Griseb.) Castellanos in *Anal. Mus. Nac. Hist. Nat. Buenos Aires*, 36: 371, tt. 2, 3, 6 (1931). *Navia brevifolia* Griseb. *Symb. Argent. in Goett. Abh.* 24: 332 (1879). Terrestrial polster-forming herbs with much branched dichotomous stems. Leaves densely rosulate at the ends of the branches, 22 mm. long, 7 mm. wide, 2.5 mm. thick, the blades narrowly triangular, fleshy, serrate, lepidote. Scape none. Inflorescence 1-3-flowered in the center of the rosette. Flowers sessile, 31 mm. long, green. Sepals free, more or less asymmetric, mucronulate, 10-13 mm. long, 6 mm. wide. Petals free, distinctly unguiculate, 30 mm. long, 7 mm. wide, bearing a single serrate 5 mm. scale at base. Stamens of the second series short-adnate to the petals, the pollen longitudinally sulcate. Style filiform. Ovary pyramidal, 5 mm. long, 3 mm. in diameter, the placentae extending the whole height of the locule. Capsule globose, 9 mm. in diameter, septicidal. Seeds fusiform, caudate at both ends. TARIJA: ARCE [?]: Valle del Tambo, *Lorentz & Hieronymus* 947 (GOET; type). Argentina.

5. *Pitcairnia* L'Hérit., nomen conservandum

Plants mostly terrestrial, rarely epiphytic, mostly stemless, but a few species definitely caulescent. Leaves fasciculate or imbricate and many-ranked along a stem, entire or spinose-serrate, the sheaths usually small, often bulbous-thickened, the blades linear to broadly elliptic with a definite petiole or narrowly triangular, sometimes dimorphic with some blades reduced to horny spinose-serrate spines, deciduous in some species. Scape usually developed. Inflorescence simple or compound. Flowers perfect, pedicellate to sessile. Sepals free, attenuate to obtuse. Petals free, slightly zygomorphic in most species, naked or appendaged on the inside near the base. Stamens from slightly exerted to shorter than the petals, anthers linear. Style filiform. Ovules many, caudate in all the Bolivian species. Fruit mostly a septicidal capsule. Seeds caudate at both ends.

- a. Inflorescence branched (uncertain in *P. platystemon*).
- b. Petals naked; sepals 20-22 mm. long.
- c. Petals long-attenuate; pedicels 23 mm. long. 1. *P. platystemon*.
- c. Petals acute or obtuse, not attenuate; pedicels 9-15 mm. long.
- d. Leaf-blades narrowed at base but not petiolate. 2. *P. multiramosa*.
- d. Leaf-blades distinctly petiolate.
- e. Leaf-blades white-furfuraceous beneath; spines of petiole 3 mm. long. 3. *P. odontopoda*.
- e. Leaf-blades not conspicuously white beneath; spines of petiole 1.5 mm. long. 4. *P. divaricata*.
- b. Petals appendaged; sepals 11-18 mm. long.
- f. Sepals attenuate; branches elongate. 5. *P. paniculata*.
- f. Sepals obtuse; branches abbreviated. 6. *P. inermis*.
- a. Inflorescence simple.
- g. Floral bracts inconspicuous; inflorescence lax.
- h. Petals naked; sepals 8-22 mm. long.
- i. Pedicels 23 mm. long, exceeding the floral bracts; petals long-attenuate. 1. *P. platystemon*.
- i. Pedicels 6-15 mm. long.
- j. Sepals 8 mm. long; leaf-blades persistent, 30-40 mm. wide. 7. *P. Trianae*.
- j. Sepals 18 mm. long; leaf-blades deciduous, 2 mm. wide. 8. *P. Cardenasii*.
- h. Petals appendaged; sepals 20-42 mm. long.
- k. Sepals 42 mm. long, attenuate; flowers spreading to reflexed. 9. *P. crassa*.
- k. Sepals 20-30 mm. long, obtuse; flowers erect to subspreading. 10. *P. lanuginosa*.
- g. Floral bracts conspicuous, broad and more or less imbricate; inflorescence dense. 11. *P. Brittoniana*.

1. **Pitcairnia platystemon** Mez in DC. Monog. Phan. 9: 421 (1896). Leaves and scape unknown. Inflorescence possibly compound but known only from fragments 31-38 cm. long, glabrous. Axis more or less glaucous, sulcate, especially toward apex. Floral bracts broadly ovate, acuminate, recurved-spreading, 15-20 mm. long. Flowers erect. Pedicels very slender, to 23 mm. long. Sepals attenuate, uncinately recurved, 22 mm. long, 4.5 mm. wide, ecarinate. Petals attenuate, 34 mm. long, yellow or green when dry, naked. Stamens included. Ovary over 1/2 superior. Ovules caudate. SANTA CRUZ: CHIQUITOS: Santiago, d'Orbigny 937 (P; type).

2. **P. multiramosa** Mez in DC. Monog. Phan. 9: 419 (1896). Flowering 1 m. or higher. Leaves dimorphic, some reduced to narrowly ovate acute sheaths, covered with a thin quickly deciduous membrane of

white scales, others foliaceous, often over 1 m. long, the blades narrowly lanceolate, narrowed toward base but not petiolate, 35 mm. wide, submembranaceous when dry, minutely furfuraceous or glabrate beneath, serrate toward apex with green antrorse spines 1 mm. long. Scape erect, very stout, glabrous. Scape-bracts erect, lanceolate, attenuate, the upper shorter than the internodes. Inflorescence amply paniculate, 5 dm. long, many-flowered, subglabrous. Primary bracts narrowly triangular, shorter than the sterile basal $\frac{1}{3}$ of the branches. Branches strict, to 25 cm. long. Floral bracts ovate-triangular, 5 mm. long. Flowers suberect. Pedicels very slender, 15 mm. long. Sepals attenuate, 22 mm. long, 4 mm. wide, slightly carinate at base, the margin pale and subscarious. Petals acute, 45 mm. long, red, naked. Stamens included. Ovary $\frac{3}{4}$ superior. Ovules caudate. CHUQUISACA: AZERO: *Weddell* 3637 (P; type); Río Azero to Monteagudo, 1900 m., *Cárdenas* 5732 (US).

3. ***P. odontopoda*** Baker, Handbk. Bromel. 93 (1889). Flowering about 1 m. high. Leaves all persistent, dimorphic, the outer with very broadly elliptic dark sheaths covered with a membrane of brown scales and blades reduced to spinose-serrate spines, the inner foliaceous with elliptic sheaths, the petioles 30 cm. long, deeply channeled, serrate with dark antrorse spines 3 mm. long, the blades linear-lanceolate, attenuate, 22-26 mm. wide, entire, reddish beneath, glabrous at maturity. Scape about equaling the leaves, slender. Scape-bracts exceeding the internodes, narrowly triangular, filiform-attenuate, entire. Inflorescence paniculate, pyramidal, the axes white-tomentulose. Primary bracts narrowly triangular, many times shorter than the branches. Branches subspreading, straight, lax, the lateral 6-10 cm. long. Floral bracts ovate-elliptic, acuminate, 5 mm. long. Pedicels slender, 9-12 mm. long. Sepals subtriangular, acute, 20 mm. long, white-puberulent. Petals acute, 4 cm. long, red, naked. Ovary over $\frac{3}{4}$ superior. Ovules caudate. LA PAZ: NOR YUNGAS: Coroico, 1500-2000 m., *Pearce* s. n. (K; type); SUR YUNGAS: Chirca, 2500 m., *Eyerdam* 25357 (F, UC).

4. ***P. divaricata*** Wittm. in Meded. Rijks Herbar. 29: 81 (1916). Flowering over 8 dm. high. Leaves dimorphic or trimorphic, the median over 1 m. long with linear blades 2-3 cm. wide, the sheaths bulbous-imbricate, ovate, covered outside with a membrane of gray-fuscous scales, the petiole distinct, 20-25 cm. long, spinose-serrate, the blades 8-9 dm. long, broadly white-striate along the median nerve when dry, the innermost leaves reduced to broad sheaths with a spinose apex. Scape erect, stout, glabrous. Scape-bracts erect, the highest narrowly lanceolate, filiform-attenuate, shorter than the internodes, entire. Inflorescence amply paniculate, to 3 dm. long. Primary bracts narrowly triangular, much shorter than the sterile bases of the branches. Branches divaricate, to 13 cm. long, 4-9-flowered, slightly

glaucous-pruinose. Floral bracts ovate-elliptic, acuminate, about half as long as the pedicels. Pedicels slender, 10 mm. long. Sepals lanceolate, acuminate and recurved at apex, 20 mm. long, nearly or quite ecarinate, glabrous. Petals linear, subobtuse, to 5 cm. long, red, naked. Stamens included. Ovary about $\frac{1}{2}$ inferior. Ovules caudate. SANTA CRUZ: CORDILLERA: Quebrada de Charagua, 900 m., *Herzog* 1212 (L; type; B).

5. *P. paniculata* (R. & P.) R. & P. Fl. Peruv. 3: 36, t. 260 (1802). *P. biattenuata* Rusby in Bull. N. Y. Bot. Gard. 4: 457 (1907). Flowering over 2 m. high. Stem erect, stout, ringed with leaf-scars. Leaves densely fasciculate, dimorphic or trimorphic, the outer reduced, scale-like or some with setiform spinose blades, the inner elongate, contracted above the sheath but not always petiolate, attenuate, to 1.5 m. long, 35 mm. broad, remotely spinulose-serrate, glabrous above, sparsely furfuraceous beneath. Scape white-furfuraceous. Scape-bracts narrowly triangular, filiform-caudate, the uppermost about equaling the internodes. Inflorescence laxly paniculate, pyramidal, 5 dm. or longer, the axis furfuraceous. Primary bracts narrowly triangular, mostly shorter than the sterile bases of the branches. Branches suberect to spreading, secundly many-flowered. Floral bracts lance-ovate, acute, much shorter than the 13 mm. long pedicels. Sepals narrowly triangular, attenuate, 15-18 mm. long. Petals 45 mm. long, red, appendaged. Stamens included. Ovary almost wholly superior. Ovules caudate. LA PAZ: MURILLO: La Paz to Hacienda Chaco, 1350 m., *M. B. Foster* 2576 (US); YUNGAS: Puente Villa, 1600 m., *Cárdenas* 3582 (GH); LARECAJA: Guanai to Tipuani, *Bang* 1352 (BM, GH, US); Tipuani, 1400 m., *Buchtien* 5349 (GH); NOR YUNGAS: Coripati, *Bang* 2155 (BM, G, GH, MICH, US). Peru.

6. *P. inermis* (Meyer in Presl) Meyer ex Schult. f. in R. & S. Syst. Veg. 7 (2): 1238 (1830). Stemless, to 5 dm. high. Leaves all alike, deciduous above the serrulate base, not at all contracted above the broadly ovate dark sheath; blade entire, linear, attenuate, 4-9 dm. long, 7-12 mm. wide, white-lepidote beneath. Scape stout, soon glabrous. Scape-bracts much exceeding the internodes, lance-ovate, entire, filiform-caudate. Inflorescence thyrsoïd, its axis stout, soon glabrous. Primary bracts almost or quite equaling the short branches. Floral bracts scale-like, shorter than the slender 7 mm. long pedicels. Sepals obtuse, 11-15 mm. long, ecarinate. Petals 30-35 mm. long, scarlet, rapidly fading to white, appendaged. Stamens included. Ovary more than $\frac{3}{4}$ superior. DEPARTMENT AND PROVINCE UNKNOWN: Coromillo, *Pearce* 521 (fide Mez, Pflanzenreich, iv. Fam. 32: 243, 244).

7. *P. Trianae* André, Énum. Bromél. 4 (Dec. 13, 1888); in Rev. Hortic. 60: 564 (Dec. 16, 1888). Flowering to 2 m. high. Leaves

numerous, persistent, 12 dm. long, the blades linear, attenuate at both ends but not petiolate, 3-4 cm. wide, soon glabrous, spinose toward base. Scape very stout, at first white-arachnoid. Scape-bracts strict, very narrowly triangular, the lower spinose-serrate, the upper entire, shorter than the internodes. Inflorescence simple, many-flowered, very dense except near base, 3-5 dm. long, the axis straight, stout, arachnoid. Floral bracts triangular-ovate, mostly shorter than the pedicels. Flowers spreading to reflexed. Pedicels very slender, 15 mm. long. Sepals oblong, obtuse, 8 mm. long, ecarinate. Petals obtuse, to 45 mm. long, equaling the stamens, white or pale yellow, naked. Ovary at least $\frac{3}{4}$ superior. Ovules short-caudate. LA PAZ: MURILLO [?]: Eastern slope of Eastern Cordillera, 1650 m. *M. B. Foster* 2574 (US). Ecuador, Colombia.

8. *P. cardenasii* L. B. Smith in *Phytologia*, 8: 505, t. 3, fig. 5-7 (1963). *P. rigida* of Catalogue, non Mez (1904). Reproducing vegetatively by scaly rhizomes, flowering 3-6 dm. high. Leaves forming bulbous rosettes that soon appear lateral by the elongation of the rhizome, entire, vestite with linear white subspreading scales, the sheaths broadly ovate, 2 cm. long, strongly nerved, castaneous toward base, the blades dimorphic, some persistent, reduced, broadly triangular, thin, stramineous, others deciduous along a straight transverse line, linear, attenuate, 10 cm. long (young), 2 mm. wide, fasciculate. Scape very slender, white-flocculose especially toward base. Scape-bracts erect, the lower imbricate, subfoliaceous and with deciduous blades, the upper narrowly triangular, shorter than the internodes. Inflorescence secundly racemose, red, sparsely white-flocculose. Floral bracts narrowly triangular, exceeding the slender 6-8 mm. long pedicels. Flowers suberect. Sepals oblong, acute, 18 mm. long, carinate at base. Petals rounded-apiculate, 45 mm. long, naked. Stamens included. Ovary $\frac{4}{5}$ superior. Seeds caudate. SANTA CRUZ: VALLE GRANDE: Cuesta de Monos, 1000 m., *Cárdenas* 4648 (US; type).

9. *P. crassa* L. B. Smith in *Lilloa*, 14: 94 (1948). Leaves and scape unknown. Inflorescence simple, laxly many-flowered, glabrous with age, the axis 1 cm. in diameter, lightly sulcate. Floral bracts reflexed, broadly lanceolate, acute, 35 mm. long, exceeding the pedicels. Flowers spreading or reflexed. Pedicels 25 mm. long, 2 mm. in diameter, angled. Sepals narrowly triangular-lanceolate, 42 mm. long, carinate, nerved. Petals appendaged. Ovary $\frac{2}{3}$ superior. Seeds caudate. LA PAZ: Yungas: Puente Villa, 1400 m., *Cárdenas* 3690 (GH; type).

10. *P. lanuginosa* R. & P. *Fl. Peru.* 3: 35, t. 258 (1802). *P. subpetiolata* Baker in *Journ. Bot.* 19: 267 (1881). *P. sessiliflora* Rusby in *Bull. N. Y. Bot. Gard.* 4: 457 (1907). Stemless, flowering 6-12 dm. high. Leaves persistent, dimorphic, the outer with broadly ovate

dark castaneous sheaths and reduced subulate spinose-serrate blades, the inner to over 1 m. long with the blades ensiform, filiform-attenuate, slightly constricted toward base, 16-22 mm. wide, glabrous above, densely white-lepidote beneath, serrate at base with spines 2 mm. long. Scape furfuraceous or glabrescent. Scape-bracts narrowly triangular, tomentose-lepidote, the upper much shorter than the internodes. Inflorescence laxly racemose, to 4 dm. long, sparsely furfuraceous or glabrous. Floral bracts ovate, attenuate or apiculate, from shorter than the pedicels to slightly exceeding them. Flowers erect to subspreading, fragrant like pineapple. Pedicels 15-25 mm. long. Sepals narrowly subtriangular, obtuse, 20-30 mm. long. Petals to 9 cm. long, red or green with purple lines, bearing a large oblong scale. Stamens included. Ovary $5/6$ superior. Seeds long-caudate. BOLIVIA: *Bang* s. n. (NY; type of *P. sessiliflora* Rusby); LA PAZ: NOR YUNGAS: Polo-Polo, Coroico, 1100 m., *Buchtien* 3675 (NY, US).

11. *P. Brittoniana* Mez in DC. Monog. Phan. 9: 451 (1896). Terrestrial or epiphytic, caulescent, flowering 1-1.5 m. high. Leaves over 1 m. long, the sheaths inconspicuous, the petioles 15-40 cm. long, coarsely spinose-serrate, the blades broadly oblanceolate, acute, 95 mm. wide, entire, soon glabrous. Inflorescence simple, 3-6 dm. long, dense, secund-flowered, the axis sparsely and finely brown-lepidote. Floral bracts ovate, acute, much shorter than the sepals, thin and soon disintegrating. Pedicels to 8 mm. long. Sepals lanceolate, attenuate with an involute uncinat apex, more or less asymmetric, 30-35 mm. long, ecarinate, thick, dark red, sparsely tomentose-lepidote toward apex. Petals broadly obtuse, 4 cm. long, orange, bearing 2 narrow obliquely attached scales near the base. Stamens included. Ovary more than $1/2$ superior. Ovules long-caudate. LA PAZ: YUNGAS: *Bang* 592 (US; type; NY); LARECAJA: Tipuani, 1400 m., *Buchtien* 5348 (GH, US).

6. *Dyckia* Schult. f.

Small to large herbs. Rhizome stout, often repent. Leaves densely rosulate, the sheaths ample, rather fleshy, the blades long and narrow, not contracted at base, spinose-serrate, rigid. Scape evident, erect, usually lateral. Inflorescence amply paniculate to simple, its bracts inconspicuous. Flowers relatively small, yellow to red. Sepals free, shorter than the petals. Petals with their bases fused into a tube with the bases of the stamens. Stamens included or exerted, the filaments free or connate above the common tube. Ovary wholly superior. Style distinct to none. Ovules many, alate.

- a. Filaments free above the common tube formed by the petals and stamens together.
- b. Stamens exerted; inflorescence glabrous.
- c. Styles distinct; inflorescence simple. 1. *D. leptostachya*.
- c. Styles none; inflorescence compound. 2. *D. pulquinensis*.

- b. Stamens included; inflorescence cinereous-tomentose. 3. *D. ferox*.
 3. *D. ferox*.
 a. Filaments connate above the common tube formed by the petals
 and stamens together; inflorescence simple, minutely furfuraceous;
 styles distinct. 4. *D. gracilis*.

1. ***Dyckia leptostachya*** Baker in Gard. Chron. 1884(2): 198 (1884). *D. boliviensis* Mez in DC. Monog. Phan. 9: 524 (1896). Leaves unknown. Scape slender, glabrous. Scape-bracts remote, small, very broadly ovate. Inflorescence simple, 15 cm. long, subdense, glabrous. Floral bracts reflexed, suborbicular, 4 mm. long, much exceeded by the sepals. Flowers subsessile, erect, 17 mm. long, red. Sepals broadly elliptic, emarginate, 9 mm. long. Petal-blades erect, very broadly obovate, subtruncate, obscurely if at all carinate. Stamens barely exerted, free above the common tube with the petals. Style half as long as the ovary. SANTA CRUZ: CHIQUITOS: Santiago, *d'Orbigny* 858 (P; type of *D. boliviensis* Mez).

2. ***D. pulquinensis*** Wittm. in Meded. Rijks Herbar. 29: 88 (1916). Leaves 14 cm. long, the blades 6 mm. wide, very laxly serrate with stout retrorse spines 5 mm. long. Scape very slender. Scape-bracts remote, triangular-ovate, acute, the upper ones 8 mm. long. Inflorescence few-branched. Primary bracts like the upper scape-bracts, much shorter than the sterile bracteate bases of the branches. Branches flexuous, very slender, laxly and subsecundly flowered. Floral bracts broadly ovate, apiculate, 3 mm. long. Flowers subsessile, 15 mm. long, glabrous. Sepals broadly ovate-elliptic, apiculate, 8 mm. long, fuscous when dry. Petals broadly obovate, rounded at apex, 14 mm. long, golden yellow, forming a tube with the stamens 1.5 mm. high. Stamens slightly exerted, free above the common tube. Ovary slenderly ellipsoid, 9 mm. long, the stigmas sessile. SANTA CRUZ: VALLE GRANDE: Pulquina, *Herzog* 1849 (L; type); *Cárdenas* 6075 (US); San Isidro, Comarapa, *Vogel* 477 (US).

3. ***D. ferox*** Mez in DC. Monog. Phan. 9: 511 (1896). *D. Meziana* O. Kuntze of Catalogue. Flowering 6 dm. high. Leaf-blades 8-20 mm. wide, covered beneath with pale closely appressed scales, laxly serrate with acicular antrorse spines 4-6 mm. long. Scape slender, soon glabrous. Scape-bracts remote, very broadly ovate, abruptly acute, entire. Inflorescence simple or few-branched, cinereous-tomentose to glabrous. Primary bracts scarcely larger than the floral bracts. Floral bracts spreading or reflexed, suborbicular-ovate, obtuse or apiculate, much shorter than the sepals. Flowers subsessile. Sepals broadly elliptic, broadly rounded, ca. 5 mm. long, subglabrous. Petals to 12 mm. long, the blades suberect, subrhombic, scarcely undulate, ecarinate or nearly so. Stamens included, the filaments free above the common tube with the petals. Styles 3, very short. SANTA CRUZ:

CORDILLERA: Cerro de Charagua, 1200 m., *Cárdenas* 2679 (GH). Paraguay, Argentina.

4. *D. gracilis* Mez in DC. Monog. Phan. 9: 516 (1896). Flowering 5 dm. high. Leaf-blades 3 dm. long, 20-25 mm. wide, covered beneath with closely appressed pale cinereous scales, serrate with spines 4 mm. long. Scape very slender, glabrous. Scape-bracts remote, broadly ovate with a short acuminate apex, entire. Inflorescence simple, lax, minutely furfuraceous. Floral bracts reflexed, suborbicular, apiculate, ca. 4 mm. long. Flowers suberect, subsessile, slender. Sepals broadly elliptic, emarginate, 7-9 mm. long. Petals 14-18 mm. long, equaling or slightly shorter than the stamens, the blade erect, obovate, nearly or quite ecarinate. Stamens connate above the common tube with the petals. Style 2-3 times shorter than the ovary. SANTA CRUZ: CHIQUITOS: San Rafael, *d'Orbigny* 1006 (P; type); ORIENTE: Roboré, 230 m., *Cárdenas* 2917 (GH); VELASCO: San Ignacio, *I. S. Nelson* s. n. (US); *Cárdenas* 5624 (US).

Key to the species of *Tillandsioideae* in fruiting condition
(The numbers refer to the species in the respective genera).

- a. Spikes with the flowers distichous (sometimes becoming secund) or else the inflorescence reduced to a single flower.
 - b. Sepals asymmetric, free, oblong or broadest near the apex, not over 9.5 mm. long *Tillandsia* subgenus *Pseudo-Catopsis*.
 - b. Sepals symmetric or, if slightly asymmetric, then ovate or lanceolate and broadest near the base.
 - c. Leaf-blades ligulate or lanceolate with curving sides, mostly flat, thin, and obscurely lepidote Subkey I.
 - c. Leaf-blades very narrowly triangular or linear, frequently involute or densely and coarsely lepidote or both.
 - d. Inflorescence compound Subkey II.
 - d. Inflorescence simple Subkey III.
- a. Spikes with the flowers in more than 2 ranks Subkey IV.

Subkey I

- a. Inflorescence compound.
 - b. Primary bracts much shorter than the branches.
 - c. Flowers suberect, imbricate *Tillandsia* 1-7.
 - c. Flowers spreading, very lax *Tillandsia* 28.
 - b. Primary bracts covering most or all of each lower spike *Tillandsia* 12, 13.
- a. Inflorescence simple.
 - d. Flowers imbricate.
 - e. Inflorescences many, axillary *Tillandsia* 18.
 - e. Inflorescence single, central.
 - f. Floral bracts ecarinate, inflated, the keel curved *Tillandsia* 17.

- f. Floral bracts carinate, laterally compressed, the keel sigmoid in outline *Vriesea* 3.
- d. Flowers divergent, lax *Vriesea* 4.

Subkey II

- a. Primary bracts much shorter than the branches or spikes.
 - b. Leaves spirally recurved and holding the plant to a branch *Tillandsia* 29.
 - b. Leaves not more than recurved, not spiral.
 - c. Inflorescence amply tripinnate, elongate; sepals 10-13 mm. long *Tillandsia* 8, 9.
 - c. Inflorescence bipinnate or rarely a basal branch divided.
 - d. Leaf-sheaths large, castaneous, strongly contrasting with the blades; floral bracts ecarinate.
 - e. Floral bracts 25-35 mm. long *Vriesea* 1.
 - e. Floral bracts 7-13 mm. long.
 - f. Inflorescence subdigitate; spikes 9-16 cm. long *Tillandsia* 10.
 - f. Inflorescence elongate; spikes 4-7 cm. long above the sterile base *Vriesea* 2.
 - d. Leaf-sheaths not contrasting greatly with the blades.
 - g. Floral bracts distinctly shorter than the 10-13 mm. long sepals; plants somewhat caulescent; leaf-blades covered with more or less spreading cinereous scales *Tillandsia* 29, 30.
 - g. Floral bracts mostly equaling to much exceeding the sepals.
 - h. Scales of the leaf-blades very closely appressed.
 - i. Floral bracts 10 mm. long, even, glabrous; leaf-blades thick *Tillandsia* 25.
 - i. Floral bracts 15-24 mm. long *Tillandsia* 53-55.
 - h. Scales of the leaf-blades more or less spreading.
 - j. Floral bracts 30 mm. long, cinereous-lepidote *Tillandsia* 11.
 - j. Floral bracts 11-25 mm. long, mostly glabrous *Tillandsia* 22, 24.
 - a. Primary bracts covering most or all of each lower spike.
 - k. Leaf-blades linear-subulate *Tillandsia* 52.
 - k. Leaf-blades narrowly but definitely triangular .. *Tillandsia* 14-16.

Subkey III

- a. Plants stemless; scales of the leaf-blades very closely appressed; leaf-sheaths conspicuous.
 - b. Leaf-sheaths dark castaneous, contrasting with the blades *Vriesea* 1.
 - b. Leaf-sheaths little if at all darker than the blades. *Tillandsia* 52-54.

- a. Plants caulescent; scales of the leaf-blades usually somewhat spreading; leaf-sheaths inconspicuous.
 - c. Leaves in more than 2 ranks.
 - d. Scape wholly covered by its bracts.
 - e. Flowers imbricate.
 - f. Floral bracts equaling or exceeding the sepals; sepals 15-20 mm. long.
 - g. Floral bracts all densely and persistently lepidote (*Tillandsia* 11.)
 - g. Floral bracts glabrous or nearly so.
 - h. Leaves strict, covered with appressed inconspicuous scales *Tillandsia* 23.
 - h. Leaves lax or contorted, covered with more or less spreading conspicuous scales.
 - i. Floral bracts to 7 cm. long, much exceeding the sepals *Tillandsia* 21.
 - i. Floral bracts 10-27 mm. long.
 - j. Floral bracts much exceeding the sepals, wholly covering the rhachis, 27 mm. long *Tillandsia* 19.
 - j. Floral bracts equaling or barely exceeding the sepals, exposing much of the rhachis, 10-25 mm. long.
 - k. Plant long-caulescent, the leaves mostly shorter than the stem, the blades 4-6 mm. wide *Tillandsia* 32.
 - k. Plant short-caulescent, the leaves much longer than the stem, the blades to 20 mm. wide *Tillandsia* 22.
 - f. Floral bracts distinctly shorter than the sepals; sepals 6.5-17 mm. long.
 - l. Plant moss-like; sepals 6.5 mm. long *Tillandsia* 36.
 - l. Plant not moss-like; sepals 10-17 mm. long *Tillandsia* 29-32.
 - e. Flowers lax, appressed to the geniculate rhachis *Tillandsia* 35.
 - d. Scape exposed for most of its length or else wanting; scape-bracts not more than 2 *Tillandsia* 37, 38.
- c. Leaves in exactly 2 ranks.
 - m. Stem wholly concealed by the imbricate leaf-sheaths, short; scape more or less developed.
 - n. Sepals free or equally short-connate; 1-2 scape-bracts often present.
 - o. Leaf-blades narrowly triangular, mucronate, usually well over 2 mm. in diameter.

- p. Leaves tomentose-lepidote *Tillandsia* 33.
- p. Leaves appressed- or slightly pruinose-lepidote
..... *Tillandsia* 38-40.
- o. Leaf-blades linear with a soft blunt apex, not over
2 mm. in diameter.
- q. Floral bracts glabrous *Tillandsia* 34.
- q. Floral bracts densely lepidote *Tillandsia* 41.
- n. Sepals much connate posteriorly; scape naked.
..... *Tillandsia* 42.
- m. Stem exposed between alternating bunches of leaves, several
meters in length *Tillandsia* 43.

Subkey IV

- a. Inflorescence compound, the spikes lax or sublax and showing the
rhachis *Guzmania* 1.
- a. Inflorescence simple, dense with the rhachis completely covered.
- b. Leaf-blades ligulate.
- c. Inflorescence much longer than broad, acute .. *Guzmania* 3, 4.
- c. Inflorescence about as broad as long.
- d. Outer bracts of the inflorescence forming an involucre
..... *Guzmania* 2.
- d. Outer bracts of the inflorescence not forming an involucre.
- e. Leaf-blades broadly rounded and retuse .. *Guzmania* 5.
- e. Leaf-blades acute *Tillandsia* 13.
- b. Leaf-blades narrowly triangular or linear-subulate.
- f. Leaf-blades linear-subulate; floral bracts coriaceous or sub-
coriaceous, densely lepidote *Tillandsia* 52.
- f. Leaf-blades narrowly but definitely triangular; floral bracts
thin.
- g. Sepals glabrous.
- h. Sepals ovate, 19 mm. long *Tillandsia* 20.
- h. Sepals lanceolate, 10 mm. long *Tillandsia* 26.
- g. Sepals lepidote, thick, coriaceous *Tillandsia* 27.

7. *Tillandsia* L.

Caulescent or acaulescent herbs of very variable habit. Leaves rosulate or fasciculate or distributed along a stem, polystichous or distichous, entire, ligulate or narrowly triangular or linear. Scape usually distinct. Inflorescence various, usually of distichous-flowered spikes or sometimes reduced to a single polystichous-flowered spike by the reduction of the spikes to single flowers or rarely the whole inflorescence reduced to a single flower. Sepals usually symmetric, free, or equally or posteriorly joined. Petals free, naked. Stamens of various lengths relative to the petals and pistil. Ovary superior, glabrous. Ovules usually many, caudate. Capsule septicidal. Seeds erect, narrowly cylindric or fusiform, the plumose appendage white, straight, basal.

- a. Stamens equaling the petals or shorter.
 - b. Sepals symmetric, or if slightly asymmetric then ovate or lanceolate and broadest below the middle.
 - c. Stamens appearing in the throat of the corolla; style slender, much longer than the ovary.
 - d. Filaments straight; flowers almost always distichous.
 - e. Stamens only a little shorter than the narrow suberect entire petal-blades 1. Subgenus *Allardtia*.
 - e. Stamens barely exceeding the claws of the petals; petal-blades spreading, broad, crenate-serrate; inflorescence simple 2. Subgenus *Aërobia*.
 - d. Filaments more or less transversely plicate; flowers often polystichous in a simple inflorescence. 3. Subgenus *Anoplophytum*.
- c. Stamens deeply included; style short and stout.
 - f. Petal-blades broad, conspicuous; inflorescence compound or simple 4. Subgenus *Phytarrhiza*.
 - f. Petal-blades narrow, inconspicuous; inflorescence simple. 5. Subgenus *Diaphoranthema*.
- b. Sepals asymmetric, nearly or quite free, broadest near the apex, not over 9.5 mm. long 6. Subgenus *Pseudo-Catopsis*.
- a. Stamens longer than the petals, exerted 7. Subgenus *Tillandsia*.

1. Subgenus *Allardtia*

- a. Flowers distichous; inflorescence compound or simple.
- b. Inflorescence compound.
- c. Spikes much exceeding the primary bracts.
- d. Leaf-blades ligulate, the sides not evenly attenuate.
- e. Sepals equally free or subfree.
 - f. Floral bracts ample and wholly concealing the rhachis; posterior sepals carinate, 25-45 mm. long. 1. *T. Fendleri*.
 - f. Floral bracts narrow and exposing much of the rhachis.
 - g. Sepals 22-40 mm. long; inflorescence amply tripinnate. 2. *T. maxima*.
 - g. Sepals 12-15 mm. long; inflorescence bipinnate or the lowest branches sometimes divided. 3. *T. rubella*.
- e. Sepals connate posteriorly more than elsewhere.
 - h. Inflorescence amply tripinnate; sepals 14-19 mm. long.
 - i. Spikes fascicled, linear, many-flowered. 4. *T. boliviana*.
 - i. Spikes pinnate along 35 cm. long branches, narrowly lanceolate, 5-7 flowered. 5. *T. Krukoffiana*.
 - h. Inflorescence bipinnate; sepals 15-26 mm. long.
 - j. Leaves densely lepidote on both sides; sepals 26 mm. long. 6. *T. Kuntzeana*.

- j. Leaves glabrous above; sepals 15 mm. long.
..... 7. *T. confinis*.
- d. Leaf-blades narrowly triangular with straight evenly attenuate sides.
- k. Inflorescence amply tripinnate, elongate; sepals 10-13 mm. long.
- l. Spikes dense; floral bracts exceeding the sepals.
..... 8. *T. longifolia*.
- l. Spikes very lax; floral bracts shorter than the sepals.
..... 9. *T. marantoidea*.
- k. Inflorescence not more than bipinnate; sepals 8-21 mm. long.
- m. Sepals obtuse, 8 mm. long; inflorescence of several spikes. 10. *T. Rusbyi*.
- m. Sepals acute, 21 mm. long; inflorescence of 2 spikes.
..... 11. *T. boliviensis*.
- c. Spikes slightly (*T. calocephala*) if at all exceeding the lower primary bracts.
- n. Leaf-blades ligulate, the sides not evenly attenuate.
- o. Inflorescence tripinnate; sepals ecarinate. 3. *T. rubella*.
- o. Inflorescence bipinnate.
- p. Spikes 1-4-flowered; leaf-sheaths green or purplish.
- q. Sepals about equaling the floral bracts, even; leaf-blades 4-6 cm. wide. 12. *T. violascens*.
- q. Sepals exceeding the floral bracts, nerved; leaf-blades 2 cm. wide. 13. *T. biflora*.
- p. Spikes 6-7-flowered; leaf-sheaths very dark castaneous, nearly black. 14. *T. fusco-guttata*.
- n. Leaf-blades narrowly triangular, the sides evenly attenuate; spikes to 3-flowered; sepals acute.
- r. Plant stemless; leaves 20-40 cm. long; inflorescence 5-6 cm. long. 15. *T. sphaerocephala*.
- r. Plant caulescent; leaves 6-10 cm. long; inflorescence 25 mm. long. 16. *T. calocephala*.
- b. Inflorescence simple.
- s. Leaf-blades ligulate.
- t. Scape central, solitary; spike 20 cm. long, 40 mm. wide.
..... 17. *T. Walteri*.
- t. Scapes axillary, numerous; spike to 8 cm. long, 15-20 mm. wide. 18. *T. complanata*.
- s. Leaf-blades narrowly-triangular.
- u. Floral bracts all densely and persistently lepidote.
..... (11. *T. boliviensis* probably has a simple inflorescence).
- u. Floral bracts glabrous or nearly so. 19. *T. Cardenasii*.
- a. Flowers polystichous; inflorescence simple.

- v. Leaf-blades ligulate; petals blue, lavender, or purple. 13. *T. biflora*.
- v. Leaf-blades narrowly triangular; petals yellow. 20. *T. ixioides*.

2. Subgenus *Aërobia*

- A single species. 21. *T. xiphioides*.

3. Subgenus *Anoplophytum*

- a. Flowers distichous; inflorescence usually compound.
 - b. Leaves covered with conspicuous spreading scales especially along the margins; floral bracts 20-25 mm. long, nearly or quite glabrous, ecarinate. 22. *T. Lorentziana*.
 - b. Leaves covered with appressed or subappressed scales; floral bracts 10-20 mm. long.
 - c. Plant caulescent; inflorescence simple. 23. *T. caulescens*.
 - c. Plant stemless; inflorescence usually compound.
 - d. Floral bracts strongly nerved, usually cinereous-lepidote, carinate. 24. *T. didisticha*.
 - d. Floral bracts nearly or quite even, lepidote at apex, ecarinate. 25. *T. vernicosa*.
- a. Flowers polystichous; inflorescence simple.
 - e. Sepals membranaceous, much longer than broad, glabrous. 26. *T. tenuifolia*.
 - e. Sepals coriaceous, suborbicular, lepidote. 27. *T. Pohliana*.

4. Subgenus *Phytarrhiza*

- a. Leaf-blades ligulate, flat; spikes very lax. 28. *T. laxissima*.
- a. Leaf-blades very narrowly triangular, mostly involute; spikes dense.
 - b. Scape-bracts imbricate or nearly so, covering most or all of the scape; leaves polystichous.
 - c. Leaves strongly coiled, stout; inflorescence long, often tripinnate. 29. *T. Duratii*.
 - c. Leaves merely curved, slender; inflorescence not more than bipinnate, digitate or simple.
 - d. Leaf-blades covered with subappressed scales; plant caulescent. 30. *T. Reichenbachii*.
 - d. Leaf-blades covered with narrow spreading scales.
 - e. Leaves longer than the stem; inflorescence usually compound. 31. *T. streptocarpa*.
 - e. Leaves shorter than the elongate stem; inflorescence simple. 32. *T. paleacea*.
 - b. Scape-bracts remote, leaving most of the setiform scape exposed; leaves distichous.
 - f. Floral bracts densely tomentose-lepidote, about equaling the sepals; leaf-blades 2-5 mm. in diameter; petals yellow. 33. *T. crocata*.

- f. Floral bracts glabrous or nearly so, mostly shorter than the sepals; leaf-blades 1-2 mm. in diameter; petals blue or violet.
..... 34. *T. bandensis*.

5. Subgenus *Diaphoranthema*

- a. Scape-bracts numerous, about equaling the internodes; leaves polystichous.
b. Spike lax, linear, the flowers less than twice as long as the internodes. 35. *T. loliacea*.
b. Spike dense or 1-flowered, lanceolate, the flowers more than twice as long as the internodes. 36. *T. tricholepis*.
a. Scape-bracts not more than 2, the scape when present largely naked.
c. Leaves 4-9 mm. long, polystichous, the plant resembling a coarse moss. 37. *T. bryoides*.
c. Leaves much larger, distichous (sometimes polystichous in *T. funebris*).
d. Stem wholly concealed by the imbricate leaf-sheaths, short; scape more or less developed.
e. Sepals free or equally short-connate; 1-2 scape-bracts often present.
f. Leaf-blades narrowly triangular, mucronate, usually well over 2 mm. in diameter.
g. Floral bracts glabrous. 38. *T. funebris*.
g. Floral bracts densely lepidote.
h. Leaf-blades laterally compressed; leaf-sheaths indistinct, but a little broader than the blades, enfolding the stem only by their extreme base. 39. *T. Gilliesii*.
h. Leaf-blades terete; leaf-sheaths distinct, much broader than the blades, enfolding the stem for most of their length. 40. *T. myosura*.
f. Leaf-blades linear with a soft blunt apex, not over 2 mm. in diameter; inflorescence dense or 1-flowered.
..... 41. *T. recurvata*.
e. Sepals much connate posteriorly; scape naked.
..... 42. *T. capillaris*.
d. Stem exposed between alternating bunches of leaves, several meters in length. 43. *T. usneoides*.

6. Subgenus *Pseudo-Catopsis*

- a. Inflorescence simple or few-branched; floral bracts suborbicular, exceeding the flowers, membranaceous. 44. *T. Seemannii*.
a. Inflorescence much branched.
b. Floral bracts about equaling the sepals or distinctly longer.
c. Floral bracts even or faintly few-nerved near the margin, without a midnerve.
d. Floral bracts not incurved, almost exactly equaling the sepals; spikes to 9 cm. long. 45. *T. spiculosa*.

- d. Floral bracts incurved toward apex, definitely exceeding the sepals; spikes 4 cm. long. 46. *T. monticola*.
- c. Floral bracts sulcate and with a definite midnerve, exceeding the sepals. 47. *T. pendulispica*.
- b. Floral bracts distinctly shorter than the sepals.
 - e. Inflorescence tripinnate.
 - f. Leaf-blades broadly ligulate; inflorescence sparsely whitish-lepidote. 48. *T. pardina*.
 - f. Leaf-blades narrowly triangular; inflorescence ferruginous-lepidote. 49. *T. Bakeri*.
 - e. Inflorescence bipinnate; leaf-blades narrowly triangular.
 - g. Scape-bracts remote; primary bracts many times shorter than the branches. 50. *T. parviflora*.
 - g. Scape-bracts mostly equaling or exceeding the internodes; primary bracts at least half as long as the branches. 51. *T. adpressa*.

7. Subgenus *Tillandsia*

- a. Leaf-sheaths nearly flat, not forming a pseudobulb.
 - b. Leaf-blades linear-subulate; inflorescence digitate or simple and with polystichous flowers. 52. *T. juncea*.
 - b. Leaf-blades narrowly but definitely triangular.
 - c. Floral bracts coriaceous; about equaling the sepals. 53. *T. polystachia*.
 - c. Floral bracts submembranaceous, much exceeding the sepals. 54. *T. Valenzuelana*.
- a. Leaf-sheaths inflated and forming a pseudobulb; scape-bracts vaginiform; sepals ecarinate. 55. *T. paraënsis*.

1. ***Tillandsia Fendleri*** Griseb. in Goett. Nachr. 1864: 17. 1865. *T. Bangii* Baker in Mem. Torr. Bot. Club 6: 124 (1896). *T. Deppiana* var. *latifolia* (Griseb.) L. B. Smith of Catalogue. Stemless, to 2 m. high. Leaves 6-10 dm. long, the blades ligulate, triangular-attenuate, to 8 cm. wide, flat, nearly or quite glabrous. Scape erect, stout. Scape-bracts densely imbricate, foliaceous. Inflorescence mostly bipinnate. Primary bracts like the upper scape-bracts, much shorter than the branches but much larger than the floral bracts. Spikes acute, complanate, densely 6-many-flowered, mostly spreading, 10-30 cm. long, 5 cm. wide, mostly short-stipitate. Floral bracts obovate, carinate toward apex, ample and concealing the rhachis, coriaceous, rigid, glabrous, even, about equaling the sepals. Flowers short-stipitate. Sepals oblong-lanceolate, 25-45 mm. long, carinate, equally subfree. Petals slightly exceeding the stamens, blue. LA PAZ: SUR YUNGAS: Asunta, near Evenay, 690-750 m., *Krukoff* 10568 (GH, NY, US). COCHABAMBA: CERCADO: Cochabamba, *Bang*, 1283 (G, GH, US; type-number of *T. Bangii* Baker); CHAPARE: Antahuacana, Espíritu Santo, 750 m., *Buchtien* s. n., 2224 (US). West Indies to Venezuela and Bolivia.

2. *T. maxima* Lillo & Hauman in Anal. Mus. Nac. Buenos Aires, 29: 416 (1917). *T. australis* Mez of Catalogue. *T. maxima* var. *densior* L. B. Smith in Lilloa, 14: 97 (1948). Flowering 8-24 dm. high with the inflorescence extended. Leaves many in a spreading rosette, the blades ligulate, subrounded, apiculate, 6-12 cm. wide, subglabrous. Scape very stout, erect and then decurved. Scape-bracts densely imbricate, foliaceous. Inflorescence amply tripinnate, very variable, glabrous. Primary bracts like the scape-bracts, ligulate, mostly much shorter than the branches. Branches bearing 1-7 spikes, the rather large sterile base bracteate. Secondary bracts much reduced, ovate, acute. Spikes lanceolate to linear, 11-30 cm. long, sublax to subdense. Floral bracts suberect, narrow and exposing most of the rhachis, broadly elliptic, equaling or slightly exceeding the sepals, even (! Castellanos) and apparently fleshy, becoming coarsely rugose when dry, ecarinate, not incurved. Sepals free, subobtuse, 22-40 mm. long, ecarinate toward apex. Petals blue or violet. Stamens included. LA PAZ: LARECAJA: Sorata, Cerro de S. Iminapi, 2650 m., *Mandon* 1187 e. p. (BM). COCHABAMBA: AYOPAYA: Sailapata, 2500 m., *Cárdenas* 3387 (GH); CAMPERO: Río Caine, 2800 m., *Cárdenas* 2113 (GH, US; type number of *T. maxima* var. *densior* L. B. Smith); MIZQUE [?]: Sevingania to Vilavila, 3900 m., *M. B. Foster* 2554 (US); TOTORA [?]: Km. 450, Cochabamba to Santa Cruz, 1200 m., *Cárdenas* 5207 (US). TARIJA: ARCE: La Merced, Bermejo, 1700 m., *Fiebrig* 2161 (GH, US). Argentina.

3. *T. rubella* Baker in Journ. Bot. 26: 44 (1888). Stemless, propagating by stolons 9-15 dm. long, flowering 5-13 dm. high. Leaves 3-6 dm. long, the blades ligulate, acute with a recurved apex, 3-5 cm. wide, subglabrous, sometimes with fine purple spots. Scape 9-14 mm. in diameter, glabrous. Scape-bracts densely imbricate, lance-elliptic, acute. Inflorescence 2-3-pinnate, ellipsoid to subthyrsoid, dense toward apex, interrupted below, glabrous or nearly so, red. Primary bracts spreading, ovate, the lowest attenuate and exceeding the branches, the upper acute, shorter than the branches. Branches short with spikes solitary or fasciculate. Secondary bracts scarcely larger than the floral bracts. Spikes lanceolate, acute, 4-6 cm. long, 16-20 mm. wide, slightly complanate, subdensely 8-12-flowered. Floral bracts imbricate but partially exposing the rhachis, broadly ovate, subobtuse, 14-20 mm. long, slightly exceeding the sepals, submembranaceous, strongly nerved. Sepals ovate, subacute, 12-15 mm. long, equally subfree, ecarinate. Petals erect, 23 mm. long, the blades narrowly elliptic. Stamens included. LA PAZ: LARECAJA: Sorata, 2650 m., *Mandon* 1187 (GH; type-number); COCHABAMBA: CERCADO: Tunari, 2400 m., *Foster* 2533 (US).

According to M. B. Foster, the young shoots of this species and of *T. maxima* are edible and are sold in the markets under the name "Horka".

4. **T. boliviana** Mez in Bull. Herb. Boiss. (ser. 2) 4: 1130 (1904). Plant large, known only from fragments. Leaves in a funnelform rosette, 4 dm. long, the blades ligulate, subacute and apiculate, 35 mm. wide, densely appressed-lepidote on both sides. Scape unknown. Inflorescence amply tripinnate, glabrous. Branches with 6 spikes, at base 2 sterile bracts, the axis compressed. Secondary bracts inconspicuous. Spikes subsessile, nutant, linear, acute, 17 cm. long, 12 mm. wide, strongly complanate, to 32-flowered. Rhachis geniculate, angled. Floral bracts ovate-elliptic, obtuse, 17 mm. long, slightly exceeding the sepals, about 3 times as long as the internodes but not covering the rhachis, coriaceous, strongly nerved, obscurely carinate toward apex. Flowers subsessile, 22 mm. long. Sepals elliptic, obtuse, 14 mm. long, chartaceous, prominently nerved, connate for 6 mm. posteriorly and 2 mm. anteriorly. Petals violet, the blades suberect, elliptic. Stamens included. WITHOUT DEPARTMENT: *Bang* 2202 (GH, type-number).

5. **T. Krukoffiana** L. B. Smith in Contrib. Gray Herb. 154: 36 (1945). Flowering at least 2 m. high. Leaves to 8 dm. long, the blades ligulate, acute or attenuate, 6 cm. wide, glabrous. Scape unknown. Inflorescence ample, very laxly 3-pinnate, the axes slender, glabrous. Primary bracts ovate, acute, 4 cm. long, shorter than the long sterile bases of the branches. Branches spreading, to 35 cm. long, bearing 1-5 sterile bracts at base. Secondary bracts like the primary but much smaller, half as long as the spikes. Spikes spreading or deflexed, narrowly lanceolate, acute, 45-65 mm. long, 10-15 mm. wide, complanate, subdensely 5-7-flowered. Floral bracts elliptic, acute, to 25 mm. long, carinate toward apex, subchartaceous, nerved, sparsely and obscurely lepidote. Flowers subsessile. Sepals elliptic, 19 mm. long, nerved, glabrous, the posterior carinate, connate for 4 mm. LA PAZ: SUR YUNGAS: Río Bopi Basin, San Bartolome, Calisaya, 750-900 m., *Krukoff* 10503 (GH; type).

6. **T. Kuntzeana** Mez in DC. Monog. Phan. 9: 790 (1896). Stemless, flowering to over 1 m. high. Leaves many, the blades attenuate, 30 mm. wide, covered on both sides with pale appressed scales. Scape erect, stout, glabrous. Scape-bracts imbricate, elliptic, acute or attenuate, coriaceous, lepidote. Inflorescence pinnate from 4-5 spikes, 2 dm. long. Primary bracts like the upper scape-bracts, much shorter than the spikes. Spikes erect, sessile, 10 cm. long, slightly complanate, densely 8-flowered. Floral bracts elliptic, acute, mucronate, 32 mm. long, 17 mm. wide, exceeding the sepals, sharply carinate, incurved at apex, coriaceous, even, glabrous. Flowers subsessile. Sepals linear, subacute, 26 mm. long, submembranaceous, nerved, glabrous, the posterior 1/3 connate. COCHABAMBA: CERCADO: Tunari, *Kuntze* (NY; type).

7. **T. confinis** L. B. Smith, *Phytologia*, 4: 218, t. 2, figs. 5-7 (1953). *T. subtropicalis* L. B. Smith in *Phytologia*, 8: 505 (1963). Stemless, flowering 3 dm. high. Leaves 20-23 cm. long, the blades ligulate with a long attenuate apex, 15-20 mm. wide, covered beneath with fine appressed cinereous scales, glabrous above. Scape erect, slender. Scape-bracts densely imbricate, the lowest subfoliaceous, the others elliptic, glabrous and lustrous except for the small narrow blade. Inflorescence laxly bipinnate from 5-7 spikes, glabrous. Primary bracts ovate, about half as long as the spikes. Spikes subspreading, subsessile, lanceolate, acute, 45 mm. long, 12 mm. wide, strongly complanate, dense. Floral bracts wholly concealing the rhachis, ovate, acute, 18 mm. long, sharply carinate with a straight apex, coriaceous, even, lustrous. Sepals lanceolate, acute, 15 mm. long, the posterior carinate, 2/3 connate. LA PAZ: LARECAJA: Hacienda Casana, Tipuani, 1400 m., *Buchtien* 7185 (US; type of *T. subtropicalis* L. B. Smith); same, 7187. Venezuela, Colombia, Ecuador, Peru.

8. **T. longifolia** Baker, *Handbk. Bromel.* 185 (1889). Flowering 2-3 m. high. Leaves 8-10 dm. long, the blades very narrowly triangular, 3-4 cm. wide, subdensely appressed-lepidote on both sides. Scape erect, very stout. Scape-bracts imbricate, foliaceous. Inflorescence pyramidal, tripinnate. Primary bracts ovate, the lowest with long foliaceous blades exceeding the branches. Branches suberect, to 2 dm. long, the sterile bases laxly bracteate. Spikes short-stipitate, linear-lanceolate, acute, 4-12 cm. long, complanate, densely 4-12-flowered. Floral bracts ovate, obtuse, to 15 mm. long, broadly convex with a thickened midnerve but scarcely carinate, coriaceous, nerved, glabrous. Sepals obovate, obtuse, 10-12 mm. long, short-connate posteriorly. Stamens included. SANTA CRUZ: CERCADO: Yungas de San Mateo, Comarapa, 2800 m., *Steinbach* 8467 (GH). Colombia, Venezuela.

9. **T. marantoidea** Rusby, *Descr. S. Amer. Pls.* 4 (1920). Caulescent, flowering over 1 m. high with an erect stem 15-20 cm. long. Leaves to 6 dm. long, the blades linear, attenuate, 10-12 mm. wide, very obscurely lepidote beneath. Scape-bracts erect, 6-15 cm. long, attenuate. Inflorescence laxly tripinnate, 45 cm. long, glabrous. Primary bracts ovate, acute, 3 cm. long, much exceeding the short naked sterile bases of the branches, subchartaceous, red. Branches spreading, subdigitately divided, the median to 10 cm. long, the lower shorter and more remote. Secondary bracts like the floral bracts. Spikes 5-8 cm. long, very lax with the flowers subspreading and about 1 cm. apart. Rhachis nearly straight, very slender, angled. Floral bracts elliptic, obtuse, 13-15 mm. long, exceeded by the sepals, ecarinate, thin, nerved. Pedicels stout. Sepals lanceolate, obtuse, 13 mm. long, ecarinate, nerved. Petal-blades 7 mm. long. Stamens included. WITHOUT DEPARTMENT: *Bang* 2570 (NY; type; US).

10. **T. Rusbyi** Baker, Handbk. Bromel. 176 (1889). *T. Buchtienii* H. Winkl. in Fedde, Repert. Spec. Nov. 7: 107 (1909). *T. Guentheri* Harms in Notizbl. 10: 794 (1929). Leaves about 30 in a dense rosette, exceeding the inflorescence, the sheaths very large, covered with castaneous scales, the blades very narrowly triangular, 10 mm. wide, involute-subulate, covered with cinereous scales. Scape suberect, slender, half as long as the leaves. Scape-bracts densely imbricate, long-laminate. Inflorescence bipinnate, distichous-branched, 11 cm. long and wide, of about 14 spikes. Primary bracts erect, broadly ovate, attenuate, scarcely exceeding the sterile bracteate bases of the branches, lepidote. Spikes suberect to spreading, nearly uniform, linear-lanceolate, acute, 9-16 cm. long, 6 mm. wide, complanate, about 20-flowered. Floral bracts laxly imbricate, subacute, 11-12 mm. long, exceeding the sepals, ecarinate, subchartaceous, nerved, lepidote. Flowers subsessile. Sepals narrowly elliptic, obtuse, 8 mm. long, equally subfree, subcoriaceous, glabrous. Petals white. Stamens included. LA PAZ: Yungas, 1800 m., *Rusby* 2163 (NY; type); LARECAJA: San Carlos, Mapiri, 850 m., *Buchtien* 369 (B; type of *T. Guentheri* Harms); Hacienda Casana, Tipuani, 1400 m., *Buchtien* 7180 (NY); MURILLO: La Paz, *Buchtien* 1268 (US; type-number of *T. Buchtienii* H. Winkl.); OMASUYOS: Copacabana, Mapiri, 850-950 m., *Krukoff* 11181 (NY). WITHOUT LOCALITY: *Bang* (NY). Peru.

11. **T. boliviensis** Baker in Mem. Torr. Bot. Club, 4 (3): 267 (1895), emend. L. B. Smith in Contrib. Gray Herb. 98: 15 (1932). Flowering 2 dm. high. Leaves fasciculate-rosulate, about equaling the inflorescence, the blades narrowly triangular, subulate-attenuate, covered with slightly spreading cinereous scales, coarsely fimbriate-lepidote along the margins. Scape almost hidden by the leaves. Scape-bracts imbricate, lanceolate, apiculate or short-caudate, densely cinereous-lepidote. Inflorescence of a terminal spike 8 cm. long and a lateral 4-5 cm. long. Primary bract like the scape-bracts, half as long as the spike. Spikes oblong-lanceolate, 4-10-flowered. Floral bracts imbricate but exposing the rhachis, lanceolate, acute, 30 mm. long, ecarinate, cinereous-lepidote. Flowers subsessile. Sepals narrowly lanceolate, acute, 21 mm. long, free, glabrous, nerved, the posterior alate-carinate. LA PAZ: MURILLO: La Paz, 3300 m., *Bang* 159a in part (NY; type).

12. **T. violascens** Mez in DC. Monog. Phan. 9: 797 (1896). Caulescent, flowering 4-7 dm. high. Stem decumbent, stout, covered with the remains of old leaves. Leaves 3-5 dm. long, the sheaths distinct, elliptic, to 18 cm. long, dark violet, the blades ligulate, attenuate, 4-6 cm. wide, minutely and obscurely punctulate-lepidote. Scape erect, to 14 mm. in diameter, glabrous. Scape-bracts densely imbricate, foliaceous with subinflated sheaths. Inflorescence densely bipinnate, thyrsoïd, 15-25 cm. long, 10 cm. in diameter, red or green. Primary bracts suberect, the middle and lower subfoliaceous and exceeding

the spikes, the upper suborbicular, apiculate, about equaling the spikes. Spikes sessile or with a short naked stipe, elliptic, subdensely 4-flowered, 4 cm. long. Floral bracts broadly ovate, rounded, about equaling the sepals, carinate, even, glabrous. Sepals elliptic, broadly rounded, 8-15 mm. long, chartaceous, even, glabrous. LA PAZ: LARECAJA: Sorata, 2700 m., *Mandon* 1174 e. p. (P; type); Unduavi, 3200 m., *Buchtien* 2599 (NY). COCHABAMBA: CHAPARE: Llanta Aduana, Colomi to Cochabamba, 3500 m., *Cárdenas* 2253 (GH); Incachaca, 2700 m., *hb. Marnier-Lapostolle s. n.* (US); AYOPAYA: Choro, 3200 m., *Cárdenas* 4382 (US); CERCADO [?]: Yungas, 3300 m., *M. B. Foster* 2547 (US); 3150 m., 2549 (US); CARRASCO: Sehuenka, *Cárdenas* 6166 (US). SANTA CRUZ: VALLE GRANDE: Comarapa, 2800 m., *Steinbach* 8561 (US).

13. *T. biflora* R. & P. Fl. Peruv. 3: 41, t. 268 (1802). Stemless, to 35 cm. high. Leaves 2 dm. long, obscurely punctulate-lepidote, often purple-spotted, the blades ligulate, acute, 2 cm. wide. Scape slender, usually curved. Scape-bracts densely imbricate, foliaceous. Inflorescence densely bipinnate or rarely reduced to a single polystichous-flowered spike, ovoid, glabrous or obscurely punctulate-lepidote. Primary bracts broadly ovate, thin, inflated, exceeding the lower and middle spikes, the lower attenuate, the upper apiculate. Spikes laxly 1-3-flowered, short-stipitate. Floral bracts broadly ovate, much shorter than the sepals, carinate, nerved, thin. Sepals oblong, obtuse or broadly acute, 12-15 mm. long, subfree, carinate, nerved. Petals ligulate, 2 cm. long, blue to purple. Stamens included. WITHOUT DEPARTMENT: *Bang* 1802 (F, GH, NY, US; distributed as "*Guzmania tricolor*"); LA PAZ: LARECAJA: Sorata, 2700 m., *Mandon* 1174 in part (S). Peru to Venezuela.

14. *T. fusco-guttata* Mez in Bull. Herb. Boiss. (ser. 2) 5: 101 (1905). Stemless, flowering 4-6 dm. high. Leaves 2-4 dm. long, the blades ligulate, acute or attenuate, 15-40 mm. wide, obscurely brown-punctulate, spotted. Scape erect or curved. Scape-bracts imbricate, foliaceous. Inflorescence densely bipinnate or interrupted at base, subpyramidal, 6-12 cm. long, 4-5 cm. in diameter. Primary bracts ovate-elliptic, long-laminate with recurving apices, exceeding the middle and lower spikes, punctulate. Spikes ovate-elliptic, acute, 25-30 mm. long, 12-15 mm. wide, complanate, densely 6-7-flowered. Floral bracts broadly ovate, equaling or slightly shorter than the sepals, carinate, glabrous, slightly nerved, subcoriaceous. Sepals obtuse, 10 mm. long, equally subfree, coriaceous. Petals 16 mm. long, blue. Stamens included. COCHABAMBA: AYOPAYA: Sailapata, 2700 m., *Cárdenas* 3030 (GH, US). Province [?]: Monte Punco, 3000 m., *Cárdenas* 5276 (US). CHAPARE: Chapare, 2000 m., *Cárdenas* 6055 (US). Peru.

15. *T. sphaerocephala* Baker in Journ. Bot. 26: 141 (1888). Stemless, flowering to 2 dm. high. Leaves 2-4 dm. long, covered with ap-

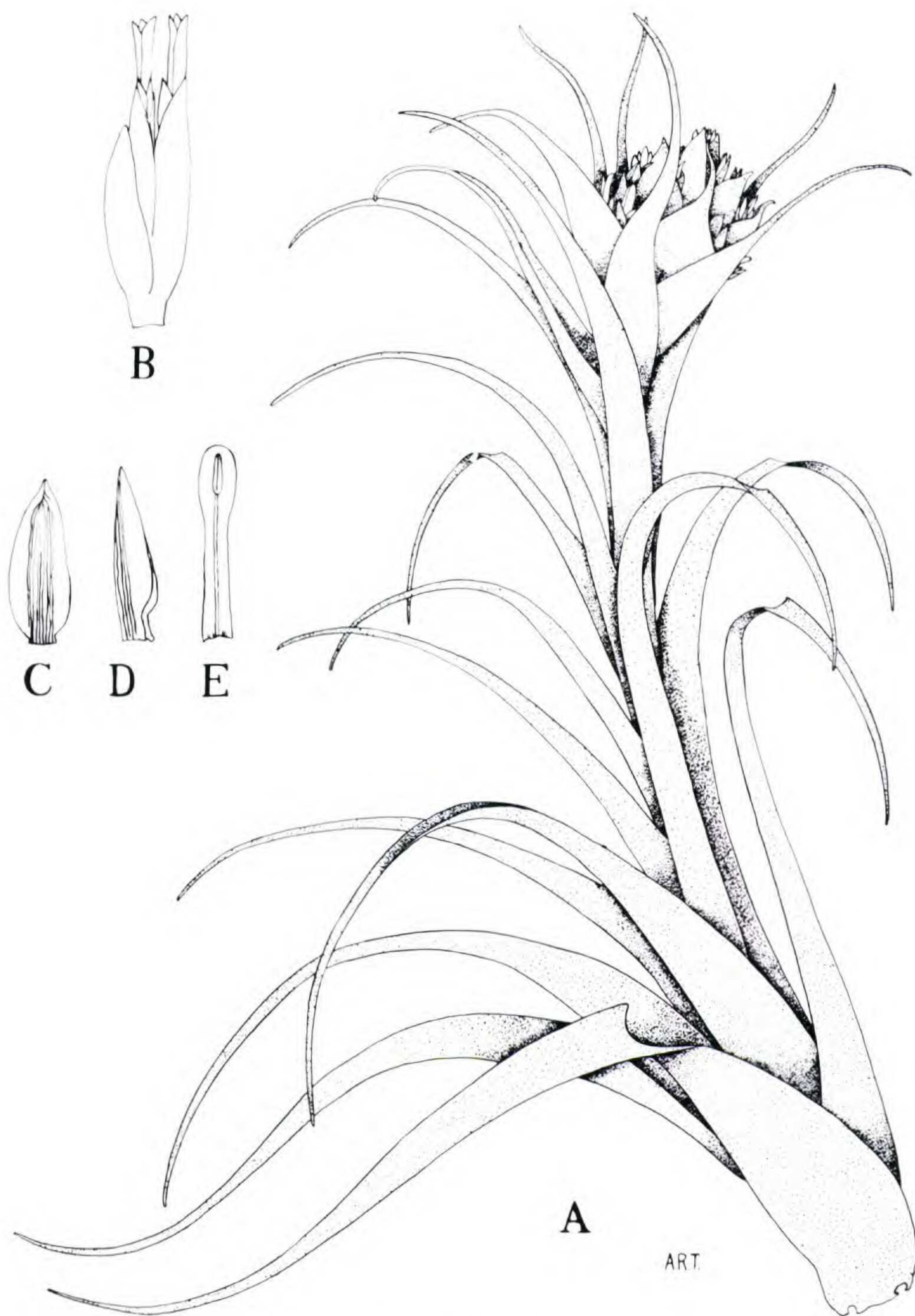


Figure (2)

A: *Tillandsia sphaerocephala* (after Bang 159); habit $\times 1/2$;
B: spike $\times 1$; C: anterior sepal $\times 1$; D: posterior sepal $\times 1$;
E: petal and stamen $\times 1$.

pressed lustrous scales, the blades narrowly triangular, 2 cm. wide, involute-subulate toward apex, erect or decurved. Scape usually curved and ascending. Scape-bracts densely imbricate, foliaceous. Inflorescence bipinnate, densely capitate, 5-6 cm. long. Outer primary bracts with a broad ovate base and long triangular apex that exceeds the inflorescence, the inner ovate, obtuse, apiculate, equaling the spikes. Spikes 1-2-flowered, strongly complanate. Floral bracts ovate, 23-30 mm. long, carinate, sparsely lepidote to glabrous, strongly nerved. Sepals ovate, acute, 20-25 mm. long, carinate. Posteriorly connate for 3 mm. Petals to 30 mm. long. Stamens included. LA PAZ: MURILLO: La Paz, 3000 m., *Bang* 159 (GH, NY, US); *Rusby* 2848 (NY); Obrajes, 3550 m., *Buchtien* 4540 (US); 3300 m., 6384 (US); 3600 m., *Cárdenas* 2419 (GH); San Jorge, 3550 m., *Buchtien* 8819 (US); LARECAJA: Sorata, 3100 m., *Mandon* 1188 (K; type); MUÑECAS: Charazani, 2700 m., *Cárdenas* 3867 (GH); INQUISIVI: Pongo de Quime, 3000 m., *White* 182 (NY). COCHABAMBA: CERCADO: Tunari, 1950 m., *M. B. Foster* 2534 (US). Fig. 2.

16. **T. calocephala** Wittm. in Meded. Rijks Herbar. 29: 90 (1916). Caulescent, flowering 22 cm. long. Leaves 6-10 cm. long, covered with subappressed cinereous scales, the blades narrowly triangular, subulate-attenuate, 10-12 mm. wide, more or less secund-recurving. Scape very short, Scape-bracts foliaceous and only slightly reduced. Inflorescence densely bipinnate, ovoid, 25 mm. long, 15-20 mm. in diameter. Primary bracts suborbicular, slightly shorter to slightly longer than the spikes, the lowest foliaceous-laminate. Spikes sessile, lanceolate, 2-3-flowered, complanate. Floral bracts imbricate, lance-ovate, 10 mm. long, slightly shorter than the sepals, carinate, thin, nerved, lepidote. Sepals lanceolate, 12 mm. long, carinate, glabrous, short-connate posteriorly. Petals 15 mm. long, violet. Stamens included. LA PAZ: MURILLO: La Paz, *Shepard* 234 (GH). COCHABAMBA: CHAPARE[?]: Rio Montehuaiko, *Herzog* 2300 (L; type). Peru.

17. **T. Walteri** Mez in Fedde, Repert. Spec. Nov. 3: 43 (1906). Stemless, flowering 5 dm. high. Leaves cinereous-lepidote, the sheaths ovate, longer than the blades, the blades lanceolate, attenuate, 2 dm. long, 4 cm. wide. Scape erect, stout. Scape-bracts imbricate, the lower ones caudate. Inflorescence simple, dense, distichously 12-16-flowered, lanceolate, 2 dm. long, 4 cm. wide, slightly complanate. Rhachis straight, alate, glabrous. Floral bracts imbricate and concealing the rhachis, broadly elliptic, obtuse, 5 cm. long, exceeding the sepals, inflated, ecarinate, nerved, glabrous. Pedicels stout, 4 mm. long. Sepals equally subfree, obtuse, 40 mm. long, nerved, glabrous. Petals 60 mm. long, violet. Stamens included. COCHABAMBA: AYOPAYA: Sailapata, 2500 m., *Cárdenas* 3312 (GH). Peru.

18. **T. complanata** Benth. Bot. Voy. Sulphur, 173 (1846). Leaves many in a dense rosette, 3-4 dm. long usually, mostly exceeding the

inflorescences, spotted, streaked, or suffused with dark purple especially toward base, the blades ligulate, abruptly acute or subobtuse, 3-5 cm. wide, obscurely punctulate-lepidote. Scares many and axillary, at length decurved with the leaves, 1-2 mm. in diameter, glabrous. Scape-bracts erect, usually imbricate, narrowly lanceolate, subchartaceous, glabrous or nearly so. Inflorescences simple, lanceolate or linear, acute, dense, to 8 cm. long, 15-20 mm. wide, usually complanate, glabrous. Floral bracts elliptic, obtuse, 15-25 mm. long, exceeding the sepals, even or nerved, ecarinate. Flowers subsessile. Sepals lanceolate, acute, 10-15 mm. long, the posterior ones carinate, usually much connate. Petals ca. 2 cm. long, rose, purple, or blue. Stamens included. LA PAZ: MURILLO: La Paz, 3000 m., *Rusby* 2855 (NY); LARECAJA: Mapiri, San Carlos, Sarampiuni, 600 m., *Buchtien* 372 (NY); Hacienda Casana, Tipuani, 1400 m., *Buchtien* 7186 (US). COCHABAMBA: CHAPARE: Antahuacana, Espíritu Santo, 750 m., *Buchtien* 2253 (US); Locotal, 1700 m., *Steinbach* 9596 (GH). Peru to Costa Rica and the West Indies.

19. **T. Cardenasii** L. B. Smith in Proc. Amer. Acad. **70**: 154 (1935). Caulescent, flowering 20-25 cm. high. Stem to 1 dm. long, simple. Leaves to 2 dm. long, the blades linear-triangular, filiform-attenuate, 8 mm. wide, densely villous-lepidote with basally produced cinereous scales, involute. Scape erect, 1 mm. in diameter, glabrous. Scape-bracts lanceolate, exceeding the internodes, dark purple, appressed-lepidote, foliaceous-laminate. Inflorescence simple, lanceolate, 5 cm. long, 1 cm. wide, complanate, densely 4-7-flowered. Floral bracts like the scape-bracts but glabrous, 27 mm. long, ecarinate, submembranaceous. Flowers subsessile. Sepals lanceolate, attenuate, 20 mm. long, free, glabrous, nerved. Petals ligulate, lilac. Stamens included. CHUQUISACA: PROVINCE [?]: Cerro Macho, 2730 m., *Cárdenas* 491 (GH; type).

20. **T. ixioides** Griseb. in Goett. Abh. **24**: 333 (1879). More or less caulescent, flowering 1-3 dm. high. Leaves many, 10-18 cm. long, covered with appressed cinereous scales, the blades very narrowly triangular, 10 mm. wide, deeply channeled becoming involute toward apex. Scape erect or ascending, equaling or exceeding the leaves, slender, glabrous. Scape-bracts imbricate, ovate, subacute, thin, stramineous, lepidote. Inflorescence simple, of 3-7 polystichous flowers, subax, 45 mm. long. Floral bracts suberect, broadly ovate or elliptic, subacute, ca. 20 mm. long, exceeded by the sepals, thin, stramineous, lepidote toward apex. Pedicels stout, to 5 mm. long. Sepals ovate, acute, to 19 mm. long, connate more highly posteriorly, carinate, nerved, glabrous. Petals to 34 mm. long, yellow, the blade elliptic. Stamens included, the filaments straight. CHUQUISACA: TOMINA: 2200 m., *Cárdenas* 4093 (GH, US). Paraguay, Uruguay, Argentina.

21. *T. xiphioides* Ker-Gawl. in Bot. Register, 2: t. 105 (1816). *T. Friesii* of Catalogue, non Mez. Flowering 15-30 cm. or higher. Stem from very short to 15 cm. long, simple to few-branched. Leaves many, polystichous but sometimes almost distichous, curved or contorted, to 25 cm. long, covered with cinereous or ferruginous subspreading scales, the blades narrowly triangular, subulate-attenuate, flat, to 2 cm. wide. Scape from almost none to 12 cm. long. Scape-bracts densely imbricate, elliptic-oblong, thin, the lower ones caudate and lepidote, the upper apiculate and nearly or quite glabrous. Inflorescence simple, of 2-10 distichous flowers, lance-oblong, acute, to 12 cm. long. Floral bracts densely imbricate, lance-oblong, acute, to 7 cm. long, much exceeding the sepals, submembranous, ecarinate, nearly or quite glabrous. Flowers to 10 cm. long. Sepals linear-lanceolate, attenuate, to 42 mm. long, free, glabrous, thin, nerved. Petals white, fragrant, the blade broadly elliptic, obtuse, spreading, 2 cm. wide, crenate-serrate. Stamens barely included or exerted from the throat of the corolla, the filaments straight. POTOSI: NOR CHICHAS: San Antonio, *Cárdenas* 93 (GH). Brazil, Uruguay, Argentina.

22. *T. Lorentziana* Griseb. in Goett. Abh. 19: 217 (1874). *T. Lorentziana* var. *simplex* O. Ktze. Rev. Gen. 3 (2): 304 (1898). Caulescent, flowering 2-7 dm. high. Leaves 2-4 dm. long, the blades very narrowly triangular, to 20 mm. wide, covered with spreading cinereous or brownish scales, often carinate, the margins coarsely ciliate-lepidote. Scape erect, slender. Scape-bracts imbricate and usually covering the scape, the lower foliaceous, the upper lanceolate, acute, densely lepidote. Inflorescence laxly bipinnate or sometimes simple, usually 12-15 cm. long with 4-8 spikes. Primary bracts like the upper scape-bracts, much shorter than the spikes. Spikes divergent, straight, oblong-lanceolate, 6 cm. long, 15 mm. wide, strongly complanate, the bracts of the sterile base as large as the floral bracts. Rhachis flexuous, slender, angled, glabrous. Floral bracts suberect, imbricate but exposing the rhachis, acute, mostly 20-25 mm. long, slightly exceeding the sepals, ecarinate, papyraceous, glabrous or nearly so. Sepals oblong, acute, 16-18 mm. long, subfree. Petals 35 mm. long, white. Stamens included, the filaments plicate. COCHABAMBA: CERCADO: Tunari, *Kuntze* s. n. (NY; type of *T. Lorentziana* var. *simplex* O. Ktze.); PROVINCE [?]: Abra de Sacaba, 2600 m., *Cárdenas* 2211 (GH); QUILLACOLLO: Cerro del Calvario, 2560 m., *Cárdenas* 3577 (GH). SANTA CRUZ: VALLE GRANDE: Pampa Grande, 1200 m., *Steinbach* 6034a (F, GH). Brazil, Paraguay, Argentina.

23. *T. caulescens* Brongn. ex Baker, Handbk. Bromel. 168 (1889). Plant to 45 cm. long. Stem much branched, to 30 cm. long. Leaves very many, rigid, arching and secund or strict, 10-15 cm. long, densely appressed- or subpruinose-lepidote, the blades narrowly tri-

angular, 5 mm. wide, involute, usually with a strong median ridge beneath. Scape distinct to almost none. Scape-bracts densely imbricate, the lower ones foliaceous, the upper elliptic, acute or apiculate, nerved, roseate, more or less lepidote. Inflorescence simple, distichously 14-flowered or less, linear or linear-lanceolate, acute, 5-7 cm. long, 10-12 mm. wide, strongly complanate. Floral bracts densely imbricate but partially exposing the rhachis, lance-ovate, acute, 15-20 mm. long, exceeding the sepals, ecarinate, subcoriaceous, glabrous, roseate. Sepals lanceolate, acute, 15 mm. long, equally subfree or connate posteriorly to 3 mm. Petals white, 25 mm. long. Stamens included, the filaments plicate. LA PAZ: SUR YUNGAS [?]: Rio Bopi Basin, 1000 m., *Rusby* 670 (NY); San Bartolome, Calisaya, 750-900 m., *Krukoff* 10042 in part (MICH); *White* 536 (NY); alt. 500 m., *White* 1068 (K, NY). Peru.

24. *T. didisticha* Baker in Journ. Bot. 26: 16 (1888). *T. crassifolia* Baker, Handbk. Bromel. 174 (1889). *Guzmania complanata* Wittm. of Catalogue. Stemless, flowering 25-35 cm. high. Leaves 1-3 dm. long, the blades very narrowly triangular, channeled, 6-20 mm. wide, covered with subappressed cinereous scales. Scape erect, slender. Scape-bracts covering the scape, elliptic, acute, densely lepidote. Inflorescence bipinnate or at base subtripinnate, dense, fan-shaped with all the spikes in one plane, 6-14 cm. long. Primary bracts erect, nearly imbricate, like the scape-bracts, much shorter than the spikes. Spikes curved-spreading from an erect base, narrowly lanceolate, 3-8 cm. long, strongly complanate, the sterile base with imbricate reduced bracts. Floral bracts imbricate and covering the rhachis, ovate, acute, 11-15 mm. long, equaling the sepals, carinate, thin, strongly nerved, densely cinereous-lepidote to nearly glabrous. Sepals narrowly lanceolate, acuminate, slightly connate posteriorly. Petals 15-20 mm. long, white. Stamens included, the filaments plicate. BENI: CERCADO MOJOS: Trinidad to Misiones Guarayos, 250 m., *Werdermann* 2357 (MO). LA PAZ: CAUPOLICÁN: Apolo, 1440 m., *Williams* 1484 (K, NY); NOR YUNGAS: Milluguaya, 900 m., *Buchtien* 4286 (US); SUR YUNGAS: San Bartolome, Calisaya, Río Bopi Basin, 750-900 m., *Krukoff* 10045 e. p. (F). COCHABAMBA: AYOPAYA: Santa Rosa, 2000 m., *Cárdenas* 4376 (US). CHUQUISACA: AZERO: Camatinga, Machareti, *Herzog* 1201 (L; type of *Guzmania complanata* Wittm.). SANTA CRUZ: CERCADO: Santa Cruz, 1000 m., *Kuntze* (NY); CHIQUITOS: *Castelnau* 2 (P; type of *T. crassifolia* Baker); Roboré de Chiquitos, 416 m., *Cárdenas* 2958 (GH); Santiago de Chiquitos 700 m., *Cutler* 7027 (GH); SARA: Buena Vista, 450 m., *Steinbach* 6664 (S). Brazil, Paraguay, Argentina.

25. *T. vernicosa* Baker in Journ. Bot. 25: 241 (1887). *T. polyphylla* Baker of Catalogue. Stemless, flowering to 3 dm. high. Leaves to 18 cm. long, covered with tightly appressed fine scales, the blades

very narrowly triangular, rigid, 20 mm. wide, deeply channeled. Scape erect, equaling or shorter than the leaves. Scape-bracts densely imbricate, broadly elliptic, lepidote, the lower short-laminate, the upper rounded. Inflorescence digitate from 3-5 spikes, to 7 cm. long. Primary bracts like the upper scape-bracts, much shorter than the spikes. Spikes erect, sessile, narrowly lanceolate, 10 cm. long, 9 mm. wide, complanate, densely 20-flowered. Floral bracts broadly elliptic, obtuse, 10 mm. long, about equaling the sepals, ecarinate, nearly or quite even, coriaceous, lepidote at apex, rose when dry. Sepals elliptic, obtuse, free, rigid, even, glabrous. Petals 20 mm. long, white. Stamens included, the filaments plicate. LA PAZ: LARECAJA: Sorata, San Pedro, 2550 m., *Mandon* 1183 (P; type of *T. polyphylla* Baker). CHUQUISACA: ORIENTE: Charagua, 800 m., *Cárdenas* 2689 (F, GH). SANTA CRUZ: CERCADO: Sierra de Santa Cruz, *Kuntze* (NY); VELASCO: 200 m., *Kuntze* (NY); San José de Chiquitos, 255 m., *Cutler* 7084 e. p. Paraguay, Argentina.

26. *T. tenuifolia* L. Sp. Pl. 286 (1753). *T. pulchella* Hook. of Catalogue. *T. pulchella* var. *rosea* of Catalogue, non *T. rosea* Lindl. More or less caulescent with stem to 25 cm. long, often branching and associated in great mats, rather variable. Leaves 5-10 cm. long, typically exceeding the inflorescence, densely and minutely appressed-lepidote throughout, the blades narrowly triangular, subulate-attenuate, 2-7 mm. wide, channeled. Scape erect or ascending, slender, short. Scape-bracts imbricate, elliptic, caudate, membranaceous, rose. Inflorescence simple, polystichous-flowered, ovoid, densely 4-10-flowered. Floral bracts like the scape-bracts but suborbicular and less caudate, much exceeding the sepals. Sepals lanceolate, acute, 10 mm. long, much connate posteriorly, membranaceous, glabrous. Petals 20 mm. long, blue, white, or rose. Stamens included, the filaments plicate. LA PAZ: LARECAJA: Sorata, 2650 m., *Mandon* 1184 (S); *Bang* 1628 e. p. (G, GH); NOR YUNGAS: Polo-polo, Coroico, 1100 m., *Buchtien* 3672 (US); INQUISIVI: Quimes, 2400 m., *White* 218 (NY). COCHABAMBA: CERCADO: Tunari, *Kuntze* (NY); CHUQUISACA: CHARCAS: Santiago, 950 m., *I. S. Nelson* 58-455 (US); TOMINA [?]: Bartolo, Monteagudo to Sucre, 1350 m., *Brooke* 5684 (NY). SANTA CRUZ: VALLE GRANDE: Samaipata, 1800 m., *Cárdenas* 3521; 1500 m., *Cárdenas* 4604 (US). West Indies to Argentina.

27. *T. Pohlana* Mez in Mart. Fl. Bras. 3 (3): 597, t. 111 (1894). Stemless or short-caulescent, flowering 15-36 cm. high. Leaves few or many, rosulate, to 28 cm. long, covered with spreading cinereous scales; sheaths small, narrow and indistinct; blades very narrowly triangular, 1-2 cm. wide, strongly channeled. Scape erect, more or less curved, slender. Scape-bracts imbricate and covering the scape, the lower foliaceous, the upper elliptic with narrow blades. Inflorescence simple with a few polystichous flowers, dense or subdense, 35-

95 mm. long, densely cinereous-lepidote except the petals. Floral bracts suberect to spreading, broadly elliptic, inflated, exceeding the flowers, the lower caudate. Flowers subsessile. Sepals free, very broadly elliptic or suborbicular, apiculate, broadly convex, 11-15 mm. long, thick, coriaceous. Petals obtuse, 18-22 mm. long, white. Stamens included. SANTA CRUZ: VELASCO: San Ignacio, *I. S. Nelson* 58-G-14 (US). Brazil, Paraguay, Argentina.

28. *T. laxissima* Mez in Bull. Herb. Boiss. (ser. 2) 5: 108 (1905). Leaves many in a dense rosette, 3 dm. long, the blades ligulate or slightly contracted at base, acute, 3 cm. wide, chartaceous, minutely appressed-lepidote. Scape unknown. Inflorescence diffusely tripinnate, the axes slender, glabrous. Primary bracts spreading, lance-ovate, shorter than the sterile bases of the branches. Spikes linear, 9 cm. long, very laxly 8-16-flowered. Floral bracts elliptic, obtuse, 7 mm. long, ecarinate, subcoriaceous, nerved, glabrous. Flowers spreading, sessile. Sepals subsymmetric, narrowly elliptic, obtuse, 13 mm. long, subequally short-connate, coriaceous, nerved, glabrous. Capsule slenderly cylindric, abruptly acute, 35 mm. long. WITHOUT DEPARTMENT: *Bang* 2301 in part (GH, NY, US; type-number).

29. *T. Duratii* Vis. in Nuov. Sagg. Padov. 5: 271 (1840). Caulescent, flowering, 2-6 dm. long. Stem stout, curved, simple, to over 1 m. long. Leaves to 45 cm. long, covered with coarse subappressed cinereous scales, the blades very narrowly triangular, spirally recurved and grasping branches of trees, 20 mm. wide, involute-subulate, rigid, thick. Scape erect, stout. Scape-bracts imbricate, elliptic, densely cinereous-lepidote, the lower linear-laminate, the upper apiculate. Inflorescence 2-3-pinnate or rarely simple, 60 cm. long. Primary bracts like the upper scape-bracts, erect and sometimes exceeding the lower spikes. Spikes strict or curved outward at apex, lanceolate or linear-lanceolate, 3-8 cm. long, 1 cm. wide, complanate, subdense. Floral bracts erect, enfolding the base of the flower and exposing the rhachis, elliptic, exceeded by the sepals, ecarinate, coriaceous, densely lepidote in the typical variety. Sepals elliptic, 14 mm. long, unequally short-connate, coriaceous, even, glabrous. Petals 30 mm. long, the blades rhombic-orbicular, 16 mm. long, blue. Stamens deeply included, exceeding the pistil. TARIJA: CHACO: Villamontes, Yaquacuna, *Troll* 387 (B); PROVINCE?: *Weddell* 4035 in part (P). Paraguay, Argentina, Uruguay.

29a. *T. Duratii* var. *saxatilis* (Hassler) L. B. Smith in Phytologia, 16: 78 (1968). *T. decomposita* Baker, Handbk. Bromel. 168 (1889). *T. Weddellii* Baker of Catalogue. *T. confusa* Hassler var. *saxatilis* Hassler in Ann. Conserv. & Jard. Bot. Genève, 20: 329 (1919). Floral bracts nearly or quite glabrous, lustrous. LA PAZ: LOAIZA: Teneria, 3000 m., *Herzog* 2488 (L). COCHABAMBA: AYOPAYA: Santa Rosa, 2000 m., *Cárdenas* 4375 (US); CERCADO: Tunari, *Kuntze* (NY, US). CHU-

QUISACA: ORIENTE: Charagua, 800 m., *Cárdenas* 2792 (F, GH). SANTA CRUZ: VELASCO: West Velasco, 200 m., *Kuntze* (NY). TARIJA: Province [?]: *Weddell* 4035 in part (P; type of *T. Weddellii* Baker). Paraguay, Argentina, Uruguay.

30. **T. Reichenbachii** Baker, Handbk. Bromel. 166 (1889). *T. tucumanensis* Mez of Catalogue. *T. Herzogii* Wittm. of Catalogue. Caulescent, flowering over 2 dm. high but usually much smaller. Leaves to 14 cm. long, the blades recurving but not spiraling, very narrowly triangular, involute-subulate, 8 mm. wide, covered with subappressed cinereous scales. Scape erect, slender. Scape-bracts imbricate, sublanceolate, subacute, nerved, lepidote. Inflorescence compactly bipinnate from 2-8 spikes or sometimes simple, to 70 mm. long, 45 mm. wide. Primary bracts like the scape-bracts but obtuse, shorter than the spikes. Spikes subsessile, erect to somewhat decurved, linear, acute, 30 mm. long, 9 mm. wide, densely 5-7-flowered, complanate. Floral bracts enfolding the flowers and exposing the rhachis, elliptic, obtuse, shorter than the sepals, nerved, glabrous, sublustrous. Sepals elliptic, rounded, 12 mm. long, unequally short-connate, subcoriaceous, even, glabrous. Petal-blades suborbicular, 7 mm. long, blue-violet. Stamens deeply included, exceeding the pistil. SANTA CRUZ: CORDILLERA: Cumbarute, 800 m., *Herzog* 1151 (L; type of *T. Herzogii* Wittm.); ORIENTE: Charagua, 800 m., *Cárdenas* 2682 (GH). CHUQUISACA: TOMINA: Montecanto, 2000 m., *Troll* 77-A (B). TARIJA: CHACO: Curuenda, 200 m., *Cárdenas* 2532 (F, GH). Argentina.

31. **T. streptocarpa** Baker in Journ. Bot. 25: 241 (1887). *T. soratensis* Baker of Catalogue. *T. condensata* Baker of Catalogue. *T. apoloensis* Rusby of Catalogue. Flowering 1-5 dm. high. Stem 1 dm. to almost lacking. Leaves 8-50 cm. long, covered with slender spreading cinereous scales, the blades spreading or recurved, linear-triangular, long-attenuate, to 15 mm. wide at base, involute-subulate. Scape erect, slender, nearly glabrous. Scape-bracts imbricate, lanceolate, acute, densely lepidote, nerved, the lowest with slender foliaceous blades. Inflorescence bipinnate from 2-12 spikes or rarely simple. Primary bracts like the upper scape-bracts, erect, much shorter than the spikes. Spikes linear to elliptic, arched-spreading from an erect densely bracteate sterile base, complanate, 3-12-flowered. Floral bracts lanceolate, acute or subobtuse, slightly shorter than the sepals, nerved, lepidote or glabrous. Flowers erect. Sepals free or very short-connate, oblong, broadly acute or obtuse, 10-13 mm. long, glabrous. Petals ca. 25 mm. long, the blades spreading, very broadly obovate, blue or purple. Stamens deeply included, exceeding the pistil. LA PAZ: LARECAJA: Sorata, 2600 m., *Mandon* 1185 (K; type of *T. soratensis* Baker); INQUISIVI: Suri, 2400 m., *White* 229 (NY); CAUPOLICÁN: Apolo, 1440 m., *Williams* 1483 (NY; type of *T. apoloensis* Rusby); CERCADO: [?]: Río La Paz, 1180 m., *I. S. Nelson* 387 (US). COCHABAMBA: AYOPAYA:

Sailapata, 2500 m., *Cárdenas* 3305 (GH); CERCADO: Tunari, 1300 m., *Kuntze* s. n. (NY). SANTA CRUZ: SARA: Buenavista, 450 m., *Steinbach* 6665 (S, Z); VELASCO: West Velasco, 200 m., *Kuntze* s. n. (NY); VALLE GRANDE: San Isidoro, Comarapa, 1700 m., *Vogel* 474 (US). TARIJA: CHACO: Villamontes, Yaquacuna, 500 m., *Troll* 387 in part (B). CHUQUISACA: AZERO: *Weddell* s. n. (P; type of *T. condensata* Baker). Brazil, Paraguay, Uruguay, Argentina, Peru.

32. *T. paleacea* Presl, Rel. Haenk. 1: 125 (1827). *T. scalarifolia* Baker of Catalogue. Flowering 1-7 dm. long. Stem at least to 35 cm. long, much branched, appearing stout because of the leaf-sheaths. Leaves more than distichous but relatively few-ranked and widely spaced so that the blade and the upper half of the sheath are clearly visible, covered with slender cinereous or finally fuscous scales, the blades abruptly spreading, usually contorted, to 12 cm. long, 4-6 mm. wide. Scape erect, slender, from very short to over 15 cm. long, glabrous or nearly so. Scape-bracts imbricate or nearly so, elliptic, apiculate, lepidote, the lower filiform-laminate. Inflorescence simple, lanceolate with 1-12 distichous flowers, acute, to 5 cm. long, dense, complanate. Floral bracts ovate or elliptic, about equaling the sepals, ecarinate, sulcate, soon glabrous. Sepals lanceolate, 10-17 mm. long, free, glabrous. Petal-blade spreading, suborbicular, blue or violet. Stamens deeply included, exceeding the pistil. BOLIVIA: *Pentland* s. n. (K; type of *T. scalarifolia* Baker). LA PAZ: LOAIZA [?]: La Granja, 2600 m., *Julio* 158 (BM, US). Chile, Peru, Colombia.

33. *T. crocata* (E. Morr.) Baker in Journ. Bot. 25: 214 (1887). *T. Mandonii* Morr. ex Mez of Catalogue. Flowering 15-35 cm. long. Stem simple or few-branched, to 2 dm. and longer. Leaves distichous, 1-3 dm. long, covered with fine narrow reflexed scales, the blades spreading or recurving, linear, long-attenuate, 2-5 mm. in diameter. Scape terminal, erect or nearly so, slender, 5-15 cm. long, retrorse-tomentose like the leaves, naked or with a single foliaceous bract. Inflorescence always simple and distichous-flowered, lanceolate or elliptic, acute, 1-4 cm. long, dense, 2-6-flowered. Floral bracts ovate, acuminate, to 2 cm. long, about equaling the sepals, densely tomentose-lepidote. Flowers fragrant. Sepals sublanceolate, broadly acute or obtuse, thin, nerved, densely appressed-lepidote except in extreme age. Petals to 2 cm. long, the blade suborbicular, obtuse, 6-8 mm. wide, bright yellow. Stamens deeply included, exceeding the pistil. LA PAZ: LARECAJA: San Pedro to Coaconi, 2650 m., *Mandon* 1180 (K; type of *T. Mandonii* Morr. ex Mez; BM, GH, S). Brazil, Uruguay, Argentina.

34. *T. bandensis* Baker in Journ. Bot. 25: 234 (1887). *T. pilosa* L. B. Smith in Phytologia 7: 175 (1960). Flowering 1-2 dm. long. Stem much branched, 4-6 dm. long. Leaves densely distichous, 5-7 cm. long, densely pruinose- or tomentose-lepidote, the blades suberect

to spreading, linear, involute, long-attenuate, 1-2 mm. in diameter. Scape terminal, erect or decurved, to 9 cm. long, ca. 0.5 mm. in diameter, lepidote at least toward base. Scape-bracts 1-2, remote, elliptic, the upper acute or apiculate, the lower usually filiform-laminate and appressed-lepidote. Inflorescence simple with 2-4 distichous flowers, linear-lanceolate, 2-3 cm. long, 3-5 mm. wide. Floral bracts not imbricate, ovate-elliptic, acute, 9-12 mm. long, the lower ones equaling or shorter than the sepals and sometimes sparsely lepidote. Flowers erect, appressed to the rhachis. Sepals subelliptic, acute, equally subfree, thin, nerved, glabrous. Petals 15-16 mm. long, the blade broadly elliptic or obovate, 5 mm. long, blue or violet. Stamens deeply included, exceeding the pistil. SANTA CRUZ: VALLE GRANDE: Cerro de Alto-Mairana, 2000 m., *Steinbach* 6039; FLORIDA: Saipina, 1800 m., *Cárdenas* 5513 (US; type of *T. pilosa* L. B. Smith).

35. *T. loliacea* Mart. ex Schult. f. Syst. Veg. 7: 1204 (1830). *T. quadriflora* Baker of Catalogue. Stem simple or branched, rarely more than 4 cm. long. Leaves densely polystichous, 2-3 (-4) cm. long, densely and coarsely pruinose-lepidote, the blades erect to suberect or arching-secund, very narrowly triangular, 3-5 mm. wide. Scape terminal, straight or curved, to 10 cm. long, less than 1 mm. in diameter, lepidote. Scape-bracts many, about equaling the internodes, elliptic, acute, nerved, densely lepidote. Inflorescence simple, linear with up to 16 distichous flowers, to 4 cm. long, lax. Rhachis strongly geniculate, excavated next the flowers, lepidote. Floral bracts not imbricate, closely enfolding the flowers, ovate, acute, equaling or shorter than the sepals, thin, nerved, densely lepidote. Flowers erect and appressed to the rhachis. Sepals lanceolate, acute, to 9 mm. long, glabrous, nerved, equally short-connate. Petals 10 mm. long, pale violet (! Mez) to yellow, the blade narrow, acute. Stamens deeply included, exceeding the pistil. BOLIVIA: *Mandon* 1176 (! Mez); COCHABAMBA: AYOPAYA: *Weddell* 4175 (P). SANTA CRUZ: CHIQUITOS: San José de Chiquitos, 255 m., *Cutler* 7083 (GH); ORIENTE: Charagua, 800 m., *Cárdenas* 2681 (GH); VELASCO: 200 m., *Kuntze* s. n. (NY). Brazil, Paraguay, Argentina, Peru.

36. *T. tricholepis* Baker in Journ. Bot. 26: 42 (1888). Plant moss-like. Stems many from a single point, densely massed, at first bearing flowers when short and simple but later elongate and much branched, to 22 cm. long. Leaves densely polystichous, typically to 15 mm. long, the blades narrowly triangular, involute, appressed or slightly divergent, reflexed-tomentose with fine linear-lobate scales. Scapes at first terminal, soon becoming pseudo-axillary by the elongation of the stem, 1-4 cm. long, 0.3-0.5 mm. in diameter, sulcate, soon glabrous. Scape-bracts evenly distributed, nearly or quite equaling the internodes, lanceolate, acute, 5-8 mm. long, thin, lepidote. Inflorescence simple, of 1-5 distichous flowers, narrowly lanceolate, to 17 mm. long.

Floral bracts like the scape-bracts but broadly ovate, enfolding the rhachis for about half their length, slightly shorter than the sepals. Flowers erect, imbricate. Sepals lanceolate, acute, 6.5 mm. long, equally short-connate, thin, glabrous or nearly so. Petals linear, yellow, the blade indistinct, obtuse, spreading. Stamens deeply included, exceeding the pistil. BENI: MOJOS: Trinidad, 250 m., *Werdermann* 2396 (S). LA PAZ: INQUISIVI: Inquisivi to Cañamina, 1700 m., *White* 272 (NY); CAUPOLICÁN: Apolo, *Williams* 1486 (BM, NY, US); LARECAJA: Poquerani, San Pedro near Sorata, 2500-2650 m., *Mandon* 1179 in part (K; type; BM, NY, P, S). SANTA CRUZ: FLORIDA: Comarapa, 2000 m., *Cárdenas* 4386 (US); *Vogel* 473 (US); CERCADO: Sierra de Santa Cruz, *Kuntze* s. n. (NY); ORIENTE: Charagua, 800 m., *Cárdenas* 2013 (GH); Agua Caliente, Charagua, *Cárdenas* 2611 (F, GH); CHIQUITOS: San José de Chiquitos, 255 m., *Cutler* 7084-B (GH). CHUQUISACA: AZERO: Camatindi, near Cumbarute and Woyuywe, Río Parapiti, *Herzog* 1195 (L, Z); VALLE GRANDE: El Palo, 1500 m., *Steinbach* 3805 (GH). TARIJA: O'CONNOR: Villamontes, Tartagal, 500 m., *Pflanz* 2151 (US). WITHOUT LOCALITY: *Pearce* s. n. (BM); *Weddell* 3655 (P). Brazil, Paraguay, Argentina.

36a *T. tricholepis* var. *macrophylla* L. B. Smith in *Lilloa*, 14: 98 (1948). Short-caulescent. Leaves to 5 cm. long, the blades very slender. LA PAZ: LARECAJA: Charopampa, Mapiri, 570 m., *Buchtien* 1270 (US; type); NOR YUNGAS: Polo-Polo, Coroico, 1100 m., *Buchtien* 4541 (US).

37. *T. bryoides* Griseb. ex Baker in *Journ. Bot.* 16: 236 (1878); in *Goett. Abh.* 24: 334 (1879). Plant small and with a habit like *Lycopodium Selago*. Stems many from a single point, densely massed, simple or few-branched, rarely more than 5 cm. long. Leaves densely polystichous, 4-6 (-9) mm. long, the blades erect, subtriangular, stout, to 2 mm. wide, densely cinereous-lepidote. Scape often lacking so that the 1-flowered inflorescence is sunk among the terminal leaves, when present evidently elongating only after anthesis, erect, slender, glabrous, naked or with a single lanceolate bract enfolding its extreme base, to 3 cm. long. Inflorescence usually terminal but sometimes becoming pseudoaxillary by the elongation of the stem, always 1-flowered. Floral bract triangular-ovate, 7 mm. long, hyaline with a single median excurrent nerve, glabrous or nearly so. Sepals narrowly elliptic, 5-9 mm. long, hyaline, 3-nerved, equally short-connate. Petals linear, fleshy, sulphur-yellow drying to orange-brown. Stamens deeply included, exceeding the pistil. LA PAZ: MURILLO [?]: Huaricana, 800 m., *Buchtien* 806 (NY, US); MURILLO: Cotaña Illimani, 2450 m., *Buchtien* 4144 (GH); LARECAJA: Sorata, 2500-2650 m., *Mandon* 1179 in part (BM); Sorata, Poqueraria San Pedro, 2400-2600 m., *Mandon* 1179 bis (G); LOAIZA [?]: Chivesi, 4000 m., *Pentland* 29 (P). COCHABAMBA: AYOPAYA: Sailapata, 2500 m., *Cárdenas* 3309 (GH); TARATA

[?]: Parotani, 2400 m., *Kuntze* s. n. (NY). POTOSÍ: PROVINCE [?]: Rio Blanco, 3000 m., *Cárdenas* 318 (US). CHUQUISACA: SUR CINTI: Camataqui, 1800 m., *Cárdenas* 213 (GH). SANTA CRUZ: ORIENTE: Charagua to Izozog, 800 m., *Cárdenas* 2690 (GH); CORDILLERA: Cumbarute and Woyuywe, Río Parapiti, *Herzog* (Herzog). WITHOUT LOCALITY: *Miers* 7592-7592x (BM). Argentina, Peru.

38. **T. funebris** Castellanos in Anal. Mus. Nac. Hist. Nat. Buenos Aires, 37: 502 (1933). Rarely flowering over 10 cm. long. Stems several from a single point, simple or few-branched, 2-5 cm. long. Leaves densely distichous or polystichous, to 5 cm. long, the blades divergent to reflexed, contorted, triangular-subulate, 2-3 mm. in diameter, densely cinereous-lepidote. Scape distinct, to 5 cm. long, slender, glabrous. Scape-bracts 2, remote, usually a somewhat lepidote one near the base of the scape and a glabrous one near its apex. Inflorescence 1-2-flowered, glabrous. Floral bracts like the upper scape-bract but more ovate, about equaling the sepals, even. Sepals lanceolate, acute, 10 mm. long, equally short-connate. Petals 13 mm. long, coffee-colored drying to dark orange-brown, the blade distinct, subrhombic, obtuse. Stamens deeply included, exceeding the pistil. SANTA CRUZ: ORIENTE: Charagua to Izozog, 800 m., *Cárdenas* 2688 (GH). Paraguay, Argentina.

39. **T. Gilliesii** Baker in Journ. Bot. 16: 240 (1878). Flowering to over 2 dm. long. Stems many from a single point, forming a dense subglobose mass, simple or few-branched. Leaves densely distichous, 2-8 cm. long, covered with subappressed subsymmetrical cinereous to ferruginous scales, the blades arching-recurved, narrowly triangular, much compressed laterally, attenuate with a very narrow channel above. Scape almost lacking to 13 cm. long, appressed-lepidote, naked or bearing a single lanceolate bract. Inflorescence 1-3-flowered, densely cinereous-lepidote, the rhachis flexuous. Floral bracts erect, lanceovate, acute, to 20 mm. long, about equaling the sepals, not more than twice as long as the internodes, ecarinate, nerved. Sepals oblong-lanceolate, to 16 mm. long, equally subfree. Petals narrow. Stamens deeply included, exceeding the pistil. COCHABAMBA: CERCADO: Arani, 2800 m., *Cárdenas* 2418 (GH). CHUQUISACA: SUR CINTI: Camataqui, 1800 m., *Cárdenas* 214 (GH); CINTI: Puca Khasa near Tacaquira, *Hammarlund* 313 (S). Argentina, Peru.

40. **T. myosura** Griseb. ex Baker in Journ. Bot. 16: 240 (1878); in Goett. Abh. 24: 333 (1879). Flowering to over 3 dm. high. Stems many from a single point, forming a dense subglobose mass, simple or few-branched. Leaves densely distichous, 5-17 cm. long, the blades strongly recurved, triangular-subulate, 3-5 mm. in diameter, evenly rounded when fresh with a channel along most of the upper side, covered with cinereous subappressed to reflexed-pruinose scales. Scape always distinct, to 20 cm. long, lepidote or glabrous, naked or with

a single lanceolate lepidote bract well removed from the inflorescence. Inflorescence simple, linear, to 8 cm. long, laxly 1-8-flowered, densely cinereous-lepidote. Floral bracts remote, rarely more than twice as long as the internodes, ovate, attenuate, to 21 mm. long, longer to shorter than the sepals, nerved. Flowers strict. Sepals oblong-lanceolate, 9-15 mm. long, equally subfree, thin. Petals linear, to 20 mm. long, yellowish white. Stamens deeply included, exceeding the pistil. COCHABAMBA: CERCADO: Cochabamba, 2530 m., *Jimenez* 22 (US). POTOSÍ: NOR CHICHAS: Cotagaita, 2600 m., *Troll* 3369 (B). Uruguay, Argentina.

41. **T. recurvata** L. Sp. Pl. (ed. 2) 1: 410 (1762). Rather variable, flowering 4-23 cm. high. Stems densely massed, simple or few-branched, 1-10 cm. long. Leaves densely distichous, 3-17 cm. long, densely pruinose-lepidote, cinereous or ferruginous, the blades usually recurved, linear, terete, 0.5-2 mm. in diameter, soft with a weak apex. Scape terminal, always distinct, to 13 cm. long, about 0.5 mm. in diameter. Scape-bracts linear-lanceolate, lepidote, 1 or rarely 2 immediately below the inflorescence, sometimes one next the inflorescence and one remote. Inflorescence 1-2(-5)-flowered, dense. Floral bracts like the scape-bracts but smaller, mostly equaling or exceeding the sepals, nerved, densely lepidote. Sepals lanceolate, 4-9 mm. long, free or equally short-connate, usually glabrous. Petals narrow, pale violet or white. Stamens deeply included, exceeding the pistil. BENI: CERCADO MOJOS: Trinidad, 250 m., *Werdermann* 2530 (S). LA PAZ: MURILLO: Cotaña, Illimani, 2450 m., *Buchtien* 4143 (NY); LARECAJA: Sorata, *Mandon* 1177 (GH, NY, S); *Williams* 2424 (BM, NY); Ingenio del Oro, 3000 m., *Rusby* 2165 (NY, US); CAUPOLICÁN: Apolo, *Williams* 1485 (BM, NY, US). SANTA CRUZ: PROVINCE [?]: Achira, 1000 m., *Steinbach* 8224 (GH); SARA: Santa Cruz, 450 m., *Steinbach* 3807 in part (GH); 7452 (BM, F, MO, S); VALLE GRANDE: El Palo, 1500 m., *Steinbach* 3807 in part (GH). Southeastern United States to northern Argentina and Chile.

42. **T. capillaris** R. & P. Fl. Peruv. 3: 42, t. 271, fig. c (1802). Very variable in both size and form, flowering to 16 cm. high. Stems many from a single point, densely massed, simple or branched. Leaves distichous, 1-4(-9) cm. long, densely and finely pruinose-lepidote, cinereous or ferruginous, the blades erect to spreading, typically linear and less than 2 mm. in diameter, obtuse. Scape typically pseudo-axillary, elongate, slender, always naked, glabrous or nearly so. Inflorescence normally 1-flowered. Floral bracts ovate, acute or apiculate, thin with 5 or more strong nerves, typically soon glabrous, usually equaling or exceeding the sepals. Sepals lanceolate, acute or obtuse, to 8 mm. long, connate posteriorly. Petals narrow with scarcely distinct blade, white, yellow, or brown. Stamens deeply included, exceeding the pistil. LA PAZ: MURILLO: La Paz, *Buchtien* 381 in part

(S); *Claude-Joseph* 1109 (US); *Weddell* 4339 (P); Río Abajo, Huari-cana, 2700 m., *Buchtien* 807 (F); Cotaña to Illimani, 2450 m., *Buchtien* 4026 (GH); Obrajes, 3300 m., *Buchtien* 6383 (US); OMASUYOS: Achacache, 4000 m., *Mandon* 1181 (BM). COCHABAMBA: CERCADO: Cochabamba, 2700 m., *Buchtien* 2416 (NY, US); Cala-Cala, *Ehrhorn* (UC); Tunari, 1950 m., *M. B. Foster* 2536 (US); Sacaba, 2500 m., *Cutler* 7427 (GH); PROVINCE [?]: Recoleta, 2560 m., *Cárdenas* 4379 (US). SANTA CRUZ: CERCADO: Santa Cruz, 600 m., *Kuntze* (NY). TARIJA: CERCADO: Tarija, 2000 m., *Cárdenas* 211: 215 (GH); PROVINCE [?]: Escayo, 3600 m., *Fiebrig* 3570 (BM); San Luis, *Pearce* s. n. (BM). Peru, Argentina.

42a. *T. capillaris* forma *incana* (Gill.) L. B. Smith in Proc. Amer. Acad. **70**: 211 (1935). Leaves short and stout, mucronate, appressed and ascending so that they form an almost continuous plane. Scapes evident after anthesis and mostly exceeding the leaves, pseudo-axillary. Floral bracts with at least 5 strong nerves meeting near the apex, glabrous or subglabrous. LA PAZ: MURILLO: Obrajes, 3450 m., *Buchtien* 9364 (GH). COCHABAMBA: CERCADO [?]: Cerro San Pedro, 2600 m., *Jiminez* 23 (US). POTOSÍ: NOR CHICHAS: Chorolque, 3900 m., *Cárdenas* 91 (GH); FRIAS: Potosí, 4000 m., *Cárdenas* 209 (GH). Argentina.

42b. *T. capillaris* forma *cordobensis* (Hieron.) L. B. Smith in Proc. Amer. Acad. **70**: 211 (1935). Leaves widely spaced so that the greater part of each sheath is uncovered. Scapes evident after anthesis, usually terminal, mostly exceeding the leaves. Floral bracts with at least 5 strong nerves meeting near the apex, densely and persistently lepidote. LA PAZ: LARECAJA: Ingenio del Oro, 3300 m., *Rusby* 2165 (F, GH); Sorata, 2600 m., *Mandon* 1177 in part (NY); *Williams* 2424 in part (US); MURILLO: Cotaña to Illimani, 2540 m., *Buchtien* 6380 (US). Argentina.

42c. *T. capillaris* forma *virescens* (R. & P.) L. B. Smith in Proc. Amer. Acad. **70**: 212 (1935). *T. Williamsii* Rusby of Catalogue. Scapes never elongating much even after anthesis, mostly shorter than the leaves. Floral bracts with at least 5 strong nerves meeting near the apex. LA PAZ: MURILLO: La Paz, *Bang* 123 (G, NY, US); *Buchtien* s. n. (US); 107 (GH); 155 in part (US); 381 in part (BM, MO, POM, S); 805 in part (MVM, NY, S, US); 2556 (NY); 9159 (GH); 9160 (GH); 9363 (GH); 9365 (GH); *Jaffuel* 585 (GH); *d'Orbigny* 298 (P); *Pentland* 27 (P); 3300 m., *Rusby* 2164 (F, NY, US); *Weddell* s. n. (P); Obrajes, 3550 m., *Buchtien* 9365 (GH); PACAJES: Ul-loma to Callapa, 400 m., *Asplund* 6382 (US); OMASUYOS: Achacache, 4000 m., *Mandon* 1181 (P); ANDES: Las Peñas, *Mandon* 1178 in part (P). ORURO: CERCADO: Cerro de Oruro, *Herzog* 2447 (L); POOPÓ: Pazña, 4200 m., *Buchtien* 1271 (US). COCHABAMBA: CERCADO: Cochabamba, 3000 m., *Kuntze* (NY). POTOSÍ: FRIAS: Potosí, *d'Orbigny*

1493 (P); Aroifilla, 3800 m., *Cárdenas* 4385 (US). TARIJA: CERCADO [?]: Escayache, *Gross* 3373 (B). Peru, Argentina, Chile.

42d. *T. capillaris* forma *Hieronymi* (Mez) L. B. Smith in Proc. Amer. Acad. **70**: 213 (1935). Habit of the typical form. Floral bracts with only 3 strong nerves meeting near the apex, the other nerves if any short and with free apices. LA PAZ: MURILLO: Palca to Illimani, 3600-4300 m., *Hauthal* s. n. (S). SANTA CRUZ: VALLE GRANDE: El Palo, 1500 m., *Steinbach* 3807 in part (GH). TARIJA: CERCADO: Tarija, 2000 m., *Cárdenas* 212 (GH). Argentina.

43. *T. usneoides* L. Sp. Pl. (ed. 2) **1**: 411 (1762). Growing pendent from trees in slender branching strands up to 8 m. long. Roots usually absent. Stem less than 1 mm. thick, sympodial, the internodes 3-6 cm. long with only the extreme base covered by the leaves, curved. Leaves distichous, 5 cm. long, densely lepidote, the blades filiform, less than 1 mm. thick. Scape lacking. Inflorescence reduced to a single flower. Floral bracts ovate, shorter than the sepals, lepidote. Sepals narrowly ovate, acute, to 7 mm. long, thin, nerved, glabrous, equally short-connate. Petals narrow, 9-11 mm. long, pale green or blue. Stamens deeply included, exceeding the pistil. LA PAZ: MURILLO: La Paz, *Buchtien* 155 in part (GH); *Jaffuel* 583 (GH); 3000 m., *Bang* 107 (BM, F, GH, MO, NY); Illimani, *Buchtien* s. n. (BM); Cotaña to Illimani, 2600 m., *Buchtien* 6381 (US); Obrajes, 3300 m., *Buchtien* (F, MO, NY, POM, S); LARECAJA: Sorata, *Mandon* 1102 (NY); *Brooke* 6524 (NY); SUR YUNGAS: Sirupaya, Yanacachi, 2100 m., *Buchtien* 390 (US). COCHABAMBA: CERCADO: Morachata to Cochabamba, *Cutler* 7698 (GH); Tunari, 1300 m., *Kuntze* s. n. (NY). CHUQUISACA: CINTI: Huarinota, 3200 m., *Hammarlund* 375 (S). SANTA CRUZ: FLORIDA: Comarapa, 2000 m., *Steinbach* 8548 (AA, US). South-eastern United States to central Argentina and Chile.

44. *T. Seemannii* (Baker) Mez in DC. Monog. Phan. **9**: 737 (1896). Stemless or short-caulescent. Leaves 10-15 cm. long, the sheaths broadly ovate, dark brown, the blades narrowly triangular, to 8 mm. wide. Scape erect, very slender, usually shorter than the leaves. Scape-bracts suberect, suborbicular, shorter than the internodes. Spikes 1 or 2, densely few-flowered. Floral bracts imbricate, suborbicular, acute or apiculate, 14 mm. long, exceeding the flowers, membranaceous, pale-lepidote. Sepals asymmetric, obtuse, 9.5 mm. long, thin, nerved, lepidote. Petals 12-15 mm. long. Stamens included. COCHABAMBA: CHAPARE: Llanta Aduana, 3500 m., *Cárdenas* 2252 (GH); CERCADO [?]: Yungas, 3300 m., *Foster* 2548 (US). Peru, Ecuador, Colombia.

45. *T. spiculosa* Griseb. in Goett. Nachr. **1864**: 17 (1865). *T. triticea* Burchell ex Baker of Catalogue. *T. micrantha* Baker of Catalogue. Stemless, flowering to 8 dm. high. Leaves 3-4 dm. long, obscurely

punctulate-lepidote, often irregularly purple-spotted, the sheaths large, broadly ovate, dark brown, the blades rounded and apiculate or acute, 2-4 cm. wide. Scape erect, often much exceeding the leaves. Scape-bracts narrowly elliptic, about equaling the internodes or the upper ones slightly shorter. Inflorescence bipinnate or tripinnate, lax. Primary bracts narrowly ovate, much shorter than the branches. Spikes linear, dense, 9 cm. long, 6-9 mm. wide, spreading, usually long-stipitate with sterile bracts at the base. Floral bracts broadly ovate, (5-) 6-9 mm. long, equaling or slightly exceeding the sepals, convex, ecarinate, coriaceous, even, glabrous or nearly so. Sepals asymmetric, elliptic, even, glabrous. Petals orange or yellow. Stamens included. LA PAZ: Yungas 1800 m., *Rusby* 2852 (NY; type of *T. micrantha* Baker); SUR YUNGAS: San Bartolome, Calisaya, 750-900 m., *Krukoff* 10512 (GH, NY); LARECAJA: Copacabana, Mapiri, 850-950 m., *Krukoff* 11155 (NY). SANTA CRUZ: COMARAPA: Yungas de San Mateo, 2500 m., *Steinbach* 8416 (GH). WITHOUT LOCALITY: *Bang* 2301 in part (F, GH). Peru and Brazil to Colombia and Trinidad.

46. *T. monticola* Mez & Sodiro in Bull. Herb. Boiss. (ser. 2) 4: 1135 (1904). Stemless, flowering 7 dm. high. Leaves 3 dm. long, punctulate-lepidote, the sheaths forming a pseudobulb, the blades oblong, acute, 35 mm. wide, rigid when dry. Scape slender, much exceeding the leaves. Scape-bracts elliptic, slightly exceeding the internodes. Inflorescence erect, laxly tripinnate, subthyrsoid, 30 cm. long, 8 cm. wide, glabrous or nearly so. Primary bracts elliptic, exceeding the sterile base of the branch. Branches subdistichously inserted, usually bearing 3 spikes. Spikes oblong, acute, 40 mm. long, 13 mm. wide, laxly 14-flowered, complanate, the rhachis geniculate. Floral bracts not imbricate nor concealing the rhachis at maturity, broadly ovate, ecarinate, 8 mm. long, exceeding the sepals, coriaceous, even, especially the upper ones incurved at apex. Sepals strongly asymmetric, obovate, broadly rounded, 6 mm. long, sparsely lepidote. Petals 7 mm. long. Stamens included. LA PAZ: LARECAJA: San Carlos, Mapiri, 850 m., *Buchtien* 367 (NY); 750 m., *Buchtien* 1266 (US). Ecuador.

47. *T. pendulispica* Mez in DC. Monog. Phan. 9: 745 (1896). *T. triangularis* Rusby of Catalogue. Stemless, flowering about 5 dm. high. Leaves 3 dm. long, densely and finely appressed-lepidote, often purple-spotted, the sheaths very large, ovate, forming an ellipsoid pseudobulb, the blades linear or narrowly triangular, attenuate, 8-12 mm. wide. Scape erect, slender, glabrous. Scape-bracts lanceolate, acute, much shorter than the internodes. Inflorescence bipinnate or the lowest branches divided, of 16 spikes or often less. Primary bracts like the scape-bracts but obtuse, usually much shorter than the sterile base of the branch. Spikes narrowly oblong, 5 cm. long, 1 cm. wide, nearly uniform, rather densely 10-20-flowered, the lower

ones long-stipitate and pendulous or arching-decurved, the rhachis geniculate. Floral bracts, suborbicular-ovate, 7 mm. long, exceeding the sepals, ecarinate, submembranaceous, nerved, soon glabrous. Sepals asymmetric, obovate, rounded-emarginate, 5 mm. long, even, soon glabrous. Petal-blades 2 mm. long, yellow. Stamens included. COCHABAMBA: CERCADO: Cochabamba, *Bang* s. n. (NY; type of *T. triangularis* Rusby). Peru, Ecuador.

48. *T. pardina* L. B. Smith in Lilloa, 14: 98 (1948). Stemless, flowering to 57 cm. high. Leaves to 24 cm. long, densely and minutely pale-lepidote, the blades ligulate, very broadly acute or subrounded and apiculate, 5 cm. wide, flat, dark-spotted. Scape erect, slender. Scape-bracts elliptic, about equaling the internodes, densely pale-lepidote. Inflorescence laxly tripinnate, 33 cm. long, sparsely lepidote. Primary bracts like the scape-bracts, shorter than the sterile bracteate bases of the branches. Branches spreading. Spikes dense or interrupted toward base, 10-17-flowered, the rhachis geniculate. Floral bracts broadly ovate, shorter than the sepals, ecarinate, even. Sepals asymmetric, broadly obovate, 5 mm. long, even. LA PAZ: LARECAJA: Hacienda Casana, Tipuani, 1400 m., *Buchtien* 7183 (US; type).

49. *T. Bakeri* L. B. Smith in Contrib. Gray Herb. 95: 45 (1931). *T. flexuosa* (Baker) Mez of Catalogue. Stemless or short-caulescent, flowering to 11 dm. high. Leaves 3 dm. long, punctulate-lepidote, thin, the sheaths narrowly ovate-elliptic, dark brown, the blades narrowly triangular, caudate, pale-lepidote. Scape erect, slender. Scape-bracts lance-elliptic, attenuate, the upper ones somewhat shorter than the internodes. Inflorescence erect or pendulous, tripinnate, 40 cm. long, 14 cm. wide, lax, the axes flexuous, slender. Lower branches with a long stipe that equals or exceeds the primary bracts, composed of 2-3 spikes. Spikes oblong, 4-5 cm. long, laxly 8-14-flowered, the rhachis straight or nearly so, densely ferruginous-lepidote. Floral bracts ovate, acute, shorter than the sepals, nerved, ferruginous-lepidote. Sepals asymmetric, elliptic, broadly rounded, 4-5 mm. long, ferruginous-lepidote. Petal-blades 1 mm. long, yellow. Stamens included. LA PAZ: LARECAJA: Anansa, Cerro de Uacani, 2700 m., *Mandon* 1172 (K; type). Peru.

50. *T. parviflora* R. & P. Fl. Peruv. 3: 41, t. 259 (1802). Stemless, flowering less than 3 dm. high. Leaves subbulbous-rosulate, 15 cm. long, finely pale-lepidote, the sheaths large, broadly ovate to suborbicular, the blades linear, attenuate, 4-8 mm. wide. Inflorescence erect or pendulous, bipinnate, pale-lepidote, the axes slender, flexuous. Primary bracts lanceolate, not more than equaling the sterile base of the branch. Spikes linear, very laxly 6-20-flowered, usually long-stipitate, spreading. Floral bracts ovate, acute, about half as long as the sepals, nerved. Flowers suberect to spreading. Sepals asymmetric, 3-4 mm. long. Petals slightly exceeding the sepals, yellow.

Stamens included. LA PAZ: SUR YUNGAS: Calisaya, Río Bopi, 1800 m., *Cárdenas* 1216; 1376 (GH). SANTA CRUZ: PROVINCE [?]: Cerro Hosana, 1400-1900 m., *Steinbach* 3457 (GH); COMARAPA: Yungas de San Mateo, 2500 m., *Steinbach* 8404 (GH). Peru.

51. *T. adpressa* André, Énum. Bromél. 6 (Dec. 13, 1888); in Rev. Hort. 60: 566 (Dec. 16, 1888). Stemless, 2-7 dm. high. Leaves usually forming an ovoid pseudo-bulb, 15-30 cm. long, the sheaths broadly elliptic-ovate, dark brown, the blades narrowly triangular, to 20 mm. wide, densely pale-lepidote. Scape erect or nearly so. Scape bracts from shorter than to exceeding the internodes, narrowly ovate-oblong, long-caudate, densely appressed-lepidote. Inflorescence bipinnate, narrow, erect or arching, the axis straight to geniculate. Primary bracts attenuate to caudate, usually equaling or exceeding the spikes. Spikes 8-12-flowered, typically erect or suberect. Floral bracts shorter than the sepals, ovate, acute, densely tomentose-lepidote. Flowers spreading. Sepals strongly asymmetric, obovate, 5 mm. long. The typical variety not found in Bolivia. Ecuador to Costa Rica.

51a. *T. adpressa* var. *Tonduziana* (Mez) L. B. Smith in Contrib. Gray Herb. 89: 8 (1930). Spikes spreading or reflexed at maturity. LA PAZ: LARECAJA: Tipuani Valley, Hacienda Casana, 1400 m., *Buchtien* 7188 (NY, US). COCHABAMBA: CARRASCO: Phaccha, 2700 m., *Cárdenas* 6287 (US); PROVINCE [?]: "Schuenka" Schuenca?, *Cárdenas* s. n. (US). Peru to Costa Rica.

52. *T. juncea* (R. & P.) Poir. in Lam. Encyc. Suppl. 5: 309 (1818). Flowering 2-4 dm. high, often propagating by scaly branching rhizomes. Leaves many in a fasciculate rosette, about equaling the inflorescence or shorter, the sheaths triangular-ovate, ferruginous, the blades linear-subulate, filiform-attenuate. Scape erect or ascending. Scape-bracts densely imbricate, lance-elliptic, attenuate, filiform-laminate, densely pale-lepidote. Inflorescence very densely digitate from a few spikes or sometimes reduced to a single densely polystichous-flowered spike, ovoid, rarely over 7 cm. long. Primary bracts like the upper scape-bracts, subinvolute below the inflorescence, their sheaths slightly shorter than the lower spikes. Spikes sessile, elliptic or lanceolate, acute, to 4 cm. long, slightly complanate. Floral bracts imbricate, broadly ovate, broadly acute or obtuse, carinate in the distichous-flowered spikes, nearly or quite even, densely lepidote. Sepals lanceolate, acute, 15-20 mm. long, coriaceous, even, glabrous or nearly so, much connate posteriorly. Petals tubular-erect, to 4 cm. long, violet. Stamens and pistil exserted. LA PAZ: SUR YUNGAS: San Bartolome, Calisaya, Río Bopi Basin, 750-900 m., *Krukoff* 10042 (GH, NY). COCHABAMBA: CERCADO: Tunari, *Kuntze* s. n. (NY). Peru to the West Indies.

53. *T. polystachia* L. Sp. Pl. (ed. 2) 1: 410 (1762). Flowering 20-65 cm. high. Leaves many in a dense subspreading rosette, usually much exceeded by the inflorescence and arched-recurving, covered with fine pale appressed scales, often with a narrow purple margin, the sheaths broadly ovate or elliptic-oblong, large and conspicuous, pale ferruginous toward the base, the blades long-attenuate, 10-25 mm. wide, usually flat. Scape erect or ascending, slender. Scape-bracts foliaceous with erect densely imbricate sheaths and long spreading or recurved blades, green, red, or purple. Inflorescence pinnately or subdigitately compound or very rarely simple, usually subcylindric or slenderly fusiform, dense, to 3 dm. long. Primary bracts elliptic, acute, the lower ones short-laminate, much shorter than the spikes. Spikes erect, sessile, linear, acute, 3-10 cm. long, 1 cm. wide, complanate. Floral bracts barely to densely imbricate, broadly ovate, 15-20 mm. long, about equaling the sepals, even and glabrous or nearly so, slightly carinate toward apex. Sepals elliptic, coriaceous, glabrous, short-connate posteriorly. Petals tubular-erect, 3 cm. long, violet. Stamens and pistil exserted. BENI: CERCADO MOJOS: Trinidad, Misiones Guarayos, 250 m., *Werdermann* 2299 (MO, S). LA PAZ: SUR YUNGAS: San Bartolome, Calisaya, 750-900 m., *Krukoff* 10516 in part (MO). SANTA CRUZ: CHIQUITOS: Puerto Suarez, *Fiedrich* 8675 (AS). Mexico and the West Indies to Brazil.

54. *T. Valenzuelana* A. Rich. Fl. Cub. Fanerog. 2: 267 (1853). Stemless, flowering 2-6 dm. high. Leaves to 4 dm. long, finely cinereous-lepidote, the sheaths concolorous with the blades, large, the blades narrowly triangular, 10-25 mm. wide, flat. Scape erect or ascending, slender, glabrous. Scape-bracts imbricate, ovate, inflated, the lower ones laminate. Inflorescence simple or pinnately compound from a few spikes. Primary bracts like the upper scape-bracts, their sheaths much shorter than the spikes but their blades sometimes exceeding them. Spikes oblong, acute, 5-20 cm. long, 1-2 cm. wide, complanate, often rather lax, 6-17-flowered, especially the terminal spike with sterile bracts at base. Floral bracts mostly 2-3 times as long as the internodes, usually exposing the rhachis, elliptic-oblong, obtuse or apiculate, 2 cm. long, much exceeding the sepals, nerved, mostly ecarinate, subglabrous. Sepals oblong, obtuse, connate posteriorly. Petals linear, 3 cm. long, lilac or violet. Stamens exserted. COCHABAMBA: AYOPAYA: Naranjito (Choco), 2200 m., *Cárdenas* 4416 (US). WITHOUT LOCALITY: *Bang* (NY). Florida and southern Mexico to Bolivia.

56. *T. paraënsis* Mez in Mart. Fl. Bras. 3(3): 586 (1894). *T. boliviensis* Baker in part but not as to type. Stemless, flowering 15-46 cm. high. Leaves to 35 cm. long, minutely pale-lepidote, the outer ones reduced to small acute sheaths, the inner sheaths large and forming an ovoid pseudobulb, the blades narrowly triangular, abruptly acute, involute. Scape curved, suberect. Scape-bracts elliptic, equaling or

slightly exceeding the internodes, densely lepidote, the lower long-laminate, the upper apiculate. Inflorescence simple or of two spikes. Primary bract like the upper scape-bracts, much shorter than the axillary spike. Spikes linear, to 25 cm. long, complanate, 6-17-flowered. Floral bracts erect and imbricate but later convolute about the flowers and exposing the rhachis, broadly elliptic or suborbicular, 25-32 mm. long, ecarinate, nerved, densely lepidote. Sepals elliptic, acute, 24 mm. long, free, ecarinate, lepidote. Petals 33-70 mm. long, erect, red. Stamens exserted. LA PAZ: LARECAJA: Tuirí, Mapiri, 490-750 m., *Krukoff* 10908 (F, GH, MO, NY); SUR YUNGAS: Santa Ana, Rio Bopi, 400 m., *White* 1087 (MICH, NY); Rio Bopi Basin, San Bartolome, Calisaya, 750-900 m., *Krukoff* 10045; 10229 (NY). SANTA CRUZ: ICHILO: Rio Yapacani, 350 m., *Steinbach* 7596 bis (GH, NY). WITHOUT LOCALITY: *Bang* 159-A in part (K, NY). Western Brazil, Peru, Colombia.

8. *Vriesea* Lindl. nomen conservandum

See *Phytologia* 13: 84 (1966).

Stemless herbs. Leaves densely rosulate, entire. Inflorescence simple or compound. Spikes usually distichous-flowered. Floral bracts conspicuous, enfolding or concealing the bases of the flowers. Sepals free. Petals nearly or quite free, bearing 2 scales on the inside at base. Ovary superior, the style elongate. Ovules many, caudate. Seeds fusiform, with a long straight basal coma.

- a. Leaf-blades narrowly triangular, densely cinereous-lepidote on both sides.
 - b. Floral bracts convex, ecarinate, 25-35 mm. long. 1. *V. incurva*.
 - b. Floral bracts carinate, 13 mm. long. 2. *V. heterandra*.
- a. Leaf-blades ligulate; inflorescence simple.
 - c. Floral bracts dense, much exceeding the sepals, chartaceous. 3. *V. heliconioides*.
 - c. Floral bracts lax, about equaling the sepals, subcoriaceous. 4. *V. Maxoniana*.

1. *Vriesea incurva* (Griseb.) R. W. Read in *Phytologia* 16: 458. 1968. *Tillandsia incurva* Griseb. ("incurvata") of Catalogue. Flowering 15-40 cm. long. Leaves many in a subglobose rosette, 15-35 cm. long, the sheaths large, distinct, broadly ovate to suborbicular, dark castaneous, the blades narrowly triangular, 2-3 cm. wide, cinereous. Scape slender, short. Scape-bracts barely imbricate, obovate or elliptic, densely lepidote, the lower caudate. Inflorescence pendulous, simple or digitate with 2-5 spikes. Primary bracts scarcely larger than the floral bracts. Spikes strict, linear or lance-linear with several sterile bracts at base, acute, 10-24 cm. long, strongly complanate, 7-16-flowered. Floral bracts two to three times as long as the internodes but usually exposing most of the rhachis, elliptic, obtuse, 25-35

mm. long, ecarinate at maturity, red, submembranaceous, nerved to almost even, lepidote to glabrous. Sepals free, elliptic, 15-20 mm. long, ecarinate, even, soon glabrous. Petals 35 mm. long, yellow. Stamens exserted. LA PAZ: LARECAJA: San Carlos, Mapiri, 850 m., *Buchtien* 373 (US). Greater Antilles to Bolivia.

2. **V. heterandra** (E. André) L. B. Smith in *Contrib. U. S. Nat. Herb.* 29: 443 (1951). Flowering to 35 cm. high. Leaves 3-4 dm. long, covered with appressed cinereous brown-centered scales, the sheaths large, dark castaneous, the blades narrowly triangular, 15-20 mm. wide. Scape curved. Scape-bracts imbricate, broadly ovate with long subsetaceous blades, densely lepidote. Inflorescence bipinnate, 15-20 cm. long. Primary bracts erect, like the scape-bracts but the upper ones merely apiculate, about equaling the sterile bases of the spikes or shorter. Spikes linear-lanceolate, acute, spreading and 4-7 cm. long above the sterile base, dense, complanate. Floral bracts ovate, acute, 13 mm. long, exceeding the sepals, lepidote. Sepals elliptic-oblong, acute, glabrous. Petals 18 mm. long, pale rose, the blades crenulate. Stamens included. LA PAZ: LARECAJA: Hacienda Casana, Tipuani, 1400 m., *Buchtien* 7184 (US). Peru to Colombia.

3. **V. heliconioides** (HBK.) Walp. *Ann. Bot.* 3: 623 (1852). *V. disticha* O. Ktze. *Rev. Gen.* 3(2): 304 (1898), as to material cited not as to basionym. *Guzmania obtusa* Rusby of Catalogue. Rarely flowering over 4 dm. high. Leaves about 2 dm. long, the blades ligulate, acute or attenuate, 15-30 mm. wide, subglabrous. Scape erect, usually much shorter than the leaves. Scape-bracts densely imbricate, very broadly ovate, acute. Inflorescence simple, distichous- or rarely polystichous-flowered, oblong, dense, 20 cm. long, 6 cm. wide, 6-18-flowered. Floral bracts very broadly ovate and triangular-acute or subrhombic, to 45 mm. long, chartaceous, the base suberect, the middle spreading horizontally and the apex incurved and sharply carinate, bright red above the middle, greenish yellow at the apex. Flowers suberect. Sepals lanceolate, attenuate, 27 mm. long, thin. Petals ligulate, acute, white. Stamens included. BENI: YACUMA: Rurrenabaque, *White* 1811 (NY; type of *Guzmania obtusa* Rusby); SANTA CRUZ: ICHILO: Yapacani, *Kuntze* (NY). Southwestern Brazil to Colombia and Central America.

4. **V. Maxoniana** (L. B. Smith) L. B. Smith in *Phytologia*, 6: 441 (1959). *Tillandsia Maxoniana* L. B. Smith of Catalogue. *V. icterica* Castellanos of Catalogue. Flowering 2-5 dm. high. Leaves 35-55 cm. long, green and lustrous, the sheaths elliptic, large, the blades arching, ligulate, acute, 20-25 mm. wide, flat. Scape erect, slender. Scape-bracts barely imbricate, elliptic, attenuate or apiculate. Inflorescence simple, laxly few-flowered, 11-20 cm. long, strongly complanate, glabrous. Floral bracts divergent and not imbricate at anthesis, elliptic, acute, 45-55 mm. long, about equaling the sepals, carinate, incurved,

subcoriaceous, greenish yellow. Sepals narrowly elliptic, acute. Petals ligulate, flavous. Stamens exserted. LA PAZ: NOR YUNGAS: Polo-Polo, Coroico, 1100 m., *Buchtien* 4538 (US; type); SANTA CRUZ: FLORIDA: Samaipata, 1500 m., *Steinbach* 8221 (GH). Argentina.

9. *Guzmania* R. & P.

Stemless herbs, mostly epiphytic. Leaves entire, the sheaths usually conspicuous. Inflorescence simple or compound, the spikes always polystichous-flowered. Sepals usually somewhat connate. Petals closely agglutinated but not truly connate, naked, yellow or white. Stamens included, the filaments more or less agglutinated to the petals. Ovules many. Capsule septicidal. Seeds with a long basal straight usually brownish coma.

- a. Inflorescence compound, its spikes lax to subdense but the rhachis always visible. 1. *G. Roezlii*.
- a. Inflorescence simple, dense, the rhachis wholly covered.
 - b. Outer bracts of the inflorescence forming a cyathiform involucre that exceeds and conceals the large flowers. 2. *G. lingulata*.
 - b. Outer bracts of the inflorescence never concealing more than the lowest flowers.
 - c. Leaf-blades obtuse to attenuate, apiculate but never retuse.
 - d. Floral bracts densely brown-lepidote; sepals attenuate. 3. *G. calothyrsa*.
 - d. Floral bracts sparsely and obscurely lepidote; sepals broadly rounded. 4. *G. Melinonii*.
 - c. Leaf-blades broadly rounded and retuse. 5. *G. retusa*.

1. *Guzmania Roezlii* (E. Morr.) Mez in DC. Monog. Phan. 9: 948 (1896). Flowering 6-10 dm. high. Leaves 4 dm. long, the sheaths broadly ovate, finely brown-lepidote, concolorous or purple-striped, the blades ligulate, rounded and apiculate, 3-4 cm. wide, glabrous above. Scape erect, slender, exceeding the leaves, glabrous. Scape-bracts ovate, shorter than the internodes. Inflorescence laxly few-branched, glabrous. Primary bracts like the scape-bracts, enfolding the sterile bases of the spikes. Spikes spreading, elongate with long sterile prophyllate bases, lax or subdense but the rhachis always visible. Floral bracts ovate, narrowly obtuse, shorter than the sepals, green. Flowers suberect to spreading, 23 mm. long. Sepals elliptic, obtuse, 16-18 mm. long, connate for 2 mm., coriaceous. Corolla white, its lobes recurved-spreading. LA PAZ: LARECAJA: San Carlos, Mapiri, 650 m., *Buchtien* 1272 (US); SUR YUNGAS: Rio Bopi Basin, San Bartolome, Calisaya, 750-900 m., *Krukoff* 10516 (GH, MO, NY). Peru to Costa Rica and Guiana.

2. *G. lingulata* (L.) Mez in DC. Monog. Phan. 9: 899 (1896). Rather variable in habit, flowering about 3 dm. high. Leaves 30-45 cm. long, the sheaths ovate, conspicuous, sometimes violet-striped, the blades

ligulate, acute, obscurely punctulate-lepidote. Scape-bracts densely imbricate, the lower ones strict, foliaceous, the uppermost lanceolate, usually red, forming a more or less spreading involucre. Inflorescence to 7 cm. wide, 10-50-flowered. Floral bracts linear, shorter than the flowers. Flowers erect, 45 mm. long. Sepals linear, obtuse, glabrous. Petals linear, cucullate, white at the apex. Stamens highly agglutinated with the petals. Coma reddish brown. LA PAZ: LARECAJA: San Carlos, Mapiri, 850 m., *Buchtien* 366 (GH, US); NOR YUNGAS: Polo-Polo, Coroico, 1100 m., *Buchtien* 3670 (US); 3673 (NY, US). Southwestern Brazil to Central America and the West Indies.

3. **G. calothyrsa** Mez in DC. Monog. Phan. 9: 910 (1896). Flowering to 1 m. high. Leaves 3-8 dm. long, densely punctulate-lepidote beneath, the blades linear, attenuate, 2-4 cm. broad. Scape stout, erect. Scape-bracts densely imbricate, lanceolate, attenuate, ferruginous-lepidote. Inflorescence strobilate, fertile throughout, 6-18 cm. long. Floral bracts broadly elliptic, acute, membranaceous, densely brown-lepidote. Sepals narrowly elliptic, attenuate, 22 mm. long, connate for 6 mm., thin, lepidote becoming glabrous. Petals obtuse. LA PAZ: LARECAJA: San Carlos, Mapiri, 750 m., *Buchtien* 1265 (US); SUR YUNGAS: Rio Bopi Basin, San Bartolome, Calisaya, 750-900 m., *Krukoff* 10488 (GH, NY). Peru, Colombia.

4. **G. Melinonis** Regel in Gartenfl. 34: 116 (1885). Flowering 20-23 cm. high. Leaves 3-5 dm. long, the blades ligulate, broadly acute or obtuse and apiculate, 2-4 cm. wide, soon glabrous. Scape straight, glabrous. Scape-bracts imbricate, strict, broadly ovate, acute, red. Inflorescence ellipsoid or subcylindric, 5-10 cm. long. Floral bracts about 4-ranked, broadly ovate, nearly equaling the flowers, sparsely and obscurely lepidote, nerved, bright red. Flowers to 33 mm. long. Sepals broadly elliptic, obtuse, 15 mm. long, short-connate, firm, even, glabrous. Petals obtuse, yellow or white. Coma white. LA PAZ: LARECAJA: Mapiri, 3000 m., *Bang* 1582 (GH). COCHABAMBA: CHAPARE: Antahuacana, Espiritu Santo, 750 m., *Buchtien* 4539 (US); Puerto Polonia, Rio Coni, San Antonio, 395 m., *Cárdenas & Cutler* 7362 (GH). Ecuador, Colombia, French Guiana.

5. **G. retusa** L. B. Smith in Fieldiana Bot. 28: 143 (1951). Leaves 5 dm. long, exceeding the inflorescence, minutely and obscurely lepidote, the blades ligulate, broadly rounded and retuse, 6 cm. wide. Scape erect, slender. Scape-bracts densely imbricate, elliptic, apiculate. Inflorescence simple, densely ellipsoid, 4.5 cm. long, 2 cm. wide, fertile throughout. Floral bracts orbicular, 2 cm. long, exceeding the sepals, coriaceous, lustrous, punctulate-lepidote, nerved or nearly even. Sepals elliptic, 13 mm. long, equally connate for 5 mm., carinate, coriaceous, sparsely lepidote at apex. Petals 23 mm. long, the free lobes broadly elliptic. Stamens included. COCHABAMBA: CHAPARE: Locotal, 1600 m., *Steinbach* 9623 (GH, US). Colombia, Venezuela.

10. *Streptocalyx* Beer

Stemless herbs. Leaves spinose-serrate. Scape elongate to almost none. Inflorescence central, bipinnate, dense. Flowers sessile. Sepals free or nearly so, asymmetric with a broad lateral wing. Petals free, narrow, naked. Stamens and pistil included. Pollen grains with 2 or 4 pores. Ovary farinose, the epigynous tube distinct. Fruit somewhat fleshy. Seeds ellipsoid or ovoid, naked.

Floral bracts ovate, about equaling the ovary; scape very short and hidden in the center of the rosette. 1. *S. Fuerstenbergii*.

Floral bracts reniform, much shorter than the ovary; scape evident. 2. *S. Poeppigii*.

1. *Streptocalyx Fuerstenbergii* (E. Morr. & Wittm.) E. Morr. in Belg. Hortic. 33: 16 (1883). Leaves 50-75 cm. long, the sheaths large, elliptic, covered with a brown membrane of fused scales, the blades ligulate, attenuate to a pungent apex, 2 cm. wide, laxly serrate with curved spines, sparsely lepidote. Scape short, stout. Scape-bracts densely imbricate, broadly ovate with narrowly triangular pungent blades, densely fimbriate-serrate, bright rose, pale-lepidote. Inflorescence bipinnate, very dense, slenderly pyramidal, 3 dm. long, 1 dm. wide, white-farinose except the petals. Primary bracts like the scape-bracts but bladeless, apiculate, erect, slightly exceeding the spikes. Spikes 6 cm. long, sublux, to 9-flowered. Floral bracts ovate, attenuate, about equaling the ovary, entire. Flowers distichous, divergent. Sepals free or nearly so, 15 mm. long exclusive of the terminal spine, 7-8 mm. wide, entire. Ovary ellipsoid, 8 mm. long, enlarged in fruit, the epigynous tube urceolate. BENI: YACUMA: Reyes, Rurrenabaque, *Fleischmann* 66 (S). Brazil.

2. *S. Poeppigii* Beer, Bromel. 141 (1857). Flowering 5-8 dm. high. Leaves to 16 dm. long, the sheaths elliptic, ample, dark castaneous, densely buff-lepidote, the blades linear, attenuate to a dark pungent cusp, 3-7 cm. wide, laxly serrate with dark curved spines 1-4 mm. long, densely white-lepidote beneath, soon glabrous above. Scape curved, red. Scape-bracts imbricate, broadly ovate with a linear blade, fimbriate-serrate, bright rose. Inflorescence densely bipinnate, slenderly cylindric or pyramidal, 2-4 dm. long, 9-15 cm. in diameter, white-farinose. Primary bracts like the scape-bracts but merely apiculate, about equaling the spikes, divergent. Spikes 5-7 cm. long, laxly 2-10-flowered. Floral bracts reniform, mucronulate, much shorter than the ovary. Sepals free, strongly asymmetric, 16-19 mm. long, mucronate. Petals bright purple. Ovary cylindric, the epigynous tube large, the placentae apical. LA PAZ: LARECAJA: Sarampiuni, San Carlos, Mapiri, 500 m., *Buchtien* 370 (US). Brazil, Peru, Colombia, Surinam.

11. *Bromelia* L.

Coarse terrestrial herbs, spreading by rhizomes or offsets. Leaves rosulate, bearing large curved spines along the margins. Inflorescence

scapose, always compound. Sepals free, unarmed. Petals without a definite claw, united into a tube by the filaments but their margins free, without appendages, fleshy. Stamens included, their filaments forming a tube of varying lengths according to the species. Berry succulent, relatively large. Seeds flattened, naked.

- a. Inflorescence very laxly paniculate, the branches to 18 cm. long. 1. *B. Hieronymii*.
- a. Inflorescence dense, the branches less than 5 cm. long.
 - b. Inflorescence cylindric, to 22 cm. long; sepals becoming glabrous. 2. *B. Balansae*.
 - b. Inflorescence globose, 6 cm. in diameter; sepals densely and persistently lepidote. 3. *B. serra*.

1. **Bromelia Hieronymii** Mez in Mart. Fl. Bras. 3(3): 199 (1891). Flowering 1 m. high, propagating by very stout rhizomes. Leaves 7 dm. long, the sheaths small, thick and forming a subglobose bulb, covered with a membrane of fused scales, the blades 30 mm. wide, mostly glabrous above, very closely pale-lepidote beneath. Scape rather slender. Scape-bracts subfoliaceous, exceeding the internodes. Inflorescence very laxly paniculate, glabrous, glaucous. Primary bracts subfoliaceous but small and much shorter than the branches. Branches suberect to spreading, 12-18 cm. long, 7-13-flowered. Floral bracts triangular, 5-6 mm. long. Pedicels rather slender, 5-11 mm. long. Sepals free, ovate, obtuse, entire, 7 mm. long. Petals 15 mm. long, connate for 7 mm., lilac. Ovary ellipsoid, 20 mm. long. SANTA CRUZ: CORDILLERA: Oriente, Izogzog, 700 m., *Cárdenas* 2755 (GH). Paraguay, Argentina.

2. **B. Balansae** Mez in Mart. Fl. Bras. 3(3): 191 (1891). Flowering to over 1 m. high, propagating by stolons. Leaves over 1 m. long, the blades attenuate, 25 mm. wide, glabrous above, closely pale-lepidote beneath, laxly serrate with antrorse spines. Scape erect, stout. Scape-bracts like the inner leaves, imbricate. Inflorescence densely cylindric, 18-22 cm. long, 7-9 cm. in diameter, the axes densely white-lanuginose. Primary bracts large covering most of the flowers. Branches to 10-flowered. Floral bracts narrowly elliptic, 30 mm. long, equaling the centers of the sepals, subglabrous. Flowers subsessile, to 45 mm. long. Sepals elliptic, obtuse, to 20 mm. long, coriaceous, allutaceous, soon glabrous. Petals linear, obtuse, 25 mm. long, connate for 7-8 mm., deep violet with broad white margins, glabrous. Filaments more than 1/2 connate. Ovary clavate, trigonous. Fruit to 47 mm. long, fleshy, edible. Seeds many, flat, 5 mm. wide. BENI: PROVINCE [?]: Rio Guaporé, Santo Antonio de Manoelito, *Black & Cordeiro* 52-15327 (IAN). Brazil, Paraguay, Argentina.

3. **B. serra** Griseb. in Goett. Abh. 24: 328 (1879). Flowering to 4 dm. high, propagating by long scaly stolons. Leaves 1.5 m. long, the

blades attenuate, 4 cm. wide, laxly serrate with antrorse uncinat spines 5 mm. long, lepidote, green above, cinereous beneath. Scape short, stout, densely lepidote. Scape-bracts foliaceous, densely imbricate, bright red. Inflorescence densely globose, 6 cm. in diameter. Primary bracts broadly ovate, 4 cm. long, covering most of the fasciculate flowers. Branches short, 5-9-flowered. Floral bracts ligulate, obtuse, cucullate, 30 mm. long, carinate, densely pale-lepidote. Pedicels 5-10 mm. long in fruit. Sepals oblong, cucullate, 15 mm. long, strongly carinate, white, lepidote. Petals elliptic, obtuse, connate for 5 mm. blue-purple with white base and margins. Filament-tube 3 mm. high. Ovary subcylindric, angled, 2 cm. long. Fruit ovoid, 40 mm. long. BENI: CERCADO MOJOS: Trinidad, Misiones Guarayos, 250 m., *Werdermann* 2300 (S). SANTA CRUZ: VELASCO: 200 m., *Kuntze* (NY); CORDILLERA: Oriente, Izogzog, 700 m., *Cárdenas* 2756 (GH). Paraguay, Argentina.

12. *Aechmea* R. & P.

Large or medium-sized herbs. Leaves rosulate. Scape conspicuous. Inflorescence simple or compound, very variable. Flowers sessile. Sepals mostly asymmetric with a large wing on the right. Petals free, bearing 2 scales. Second series of stamens more or less joined to the petals, the pollen grains with 2 or 4 pores. Ovules caudate or obtuse. Berry usually dry. Seeds small, rugose, dark.

a. Inflorescence compound.

b. Floral bracts neither decurrent nor forming pouches about the flowers.

c. Floral bracts forming a sheath that completely encloses the base of the ovary; inflorescence densely ferruginous-lepidote. 1. *Ae. Kuntzeana*.

c. Floral bracts not completely enclosing the base of the ovary, their margins failing to meet.

d. Floral bracts equaling or exceeding the ovaries, navicular.

e. Spike-rhachis excavated. 2. *Ae. angustifolia*.

e. Spike-rhachis merely angled. 3. *Ae. brachyclada*.

d. Floral bracts distinctly shorter than the ovaries.

f. Upper scape-bracts reflexed, massed beneath the inflorescence, serrate. 4. *Ae. Castelnavii*.

f. Upper scape-bracts suberect, entire. 5. *Ae. tocantina*.

b. Floral bracts decurrent and forming pouches around the flowers. 6. *Ae. distichantha*.

a. Inflorescence simple, strobilate, densely white-lanate; sepals unarmed. 7. *Ae. bromeliifolia*.

1. *Aechmea Kuntzeana* Mez in DC. Monog. Phan. 9: 208 (1896). Leaf-blades ligulate, subrounded and terminating in a stout dark spine, nearly 9 cm. wide, serrate with black antrorse spines, densely lepidote beneath. Scape erect, stout, ferruginous-tomentose. Upper

scape-bracts reflexed, elliptic, serrate with dark spines. Inflorescence bipinnate, subdensely cylindric, 20 cm. long, 5 cm. wide, ferruginous-lepidote. Branches suberect to spreading, 2-flowered, very short, all fertile but especially the highest with the terminal bracts changed to elongate spines with pulvinate bases. Floral bracts strongly asymmetric, much wider than long, bearing a dark suberect spine 21 mm. long, enfolding the ovary, entire, the margins free from the rhachis. Flowers 25 mm. long without the petals. Sepals strongly asymmetric, free, minutely mucronate. Ovary 6 mm. long. BENI: CERCADO MOJOS: Trinidad, Misiones Guarayos, 250 m., *Werdermann* 2420 (MO); YACUMA: Rurrenabaque, 300 m., *Rusby* (Mulford Exped.) 1252 (NY). SANTA CRUZ: ICHILO: Yapacani, 400 m., *Kuntze* (NY; type).

2. *Ae. angustifolia* Poepp. & Endl. Nov. Gen. & Spec. 2: 43, t. 159 (1838). *Ae. boliviana* Rusby of Catalogue. *Ae. inconspicua* Harms of Catalogue. Flowering to 75 cm. high. Leaves 5-7 dm. long, the sheaths 1 dm. long, forming an ellipsoid tank, densely and finely brown-lepidote, the blades ligulate, 3-6 cm. wide, cinereous-lepidote, spinose-serrate, concolorous. Scape erect, becoming glabrous. Scape-bracts elliptic, acute, serrate, red. Inflorescence bipinnate, cylindric, dense or lax, fertile throughout, 15-36 cm. long. Lowest primary bracts like the scape-bracts, exceeding the spikes, the others abruptly reduced to about the size of the floral bracts. Spikes spreading or reflexed, distichously 10-flowered, 20-55 mm. long, the rhachis undulate, excavated. Floral bracts spreading, cymbiform, broadly ovate with a straight mucro, 5 mm. long, barely exceeding the ovary. Sepals asymmetric, mucronate, 4-5 mm. long, free. Petals linear, mucronate, 8-10 mm. long. Ovary ellipsoid, the placentae apical, the ovules caudate. LA PAZ: LARECAJA: Mapiri, San Carlos, 850 m., *Buchtien* 368 (B; type of *Ae. inconspicua* Harms; NY); 374 (US); 750 m., *Buchtien* 1264 (US); NOR YUNGAS: Polo-Polo, Coroico, 1100 m., *Buchtien* 4537 (US); SUR YUNGAS: Río Bopi Basin, San Bartolome, Calisaya, 750-900 m., *Krukoff* 10510 (NY); *Krukoff* 10511 (GH, NY); LARECAJA: Copacabana, Mapiri, 850-950 m., *Krukoff* 11368 (NY); CAUPOLICÁN: Tumupasa, 540 m., *Williams* 525 (NY). WITHOUT LOCALITY: *Bang* s. n. (NY; type of *Ae. boliviana* Rusby).

3. *Ae. brachyclada* Baker, Handbk. Bromel. 37 (1889). Flowering 6 dm. high. Leaves 4 dm. long, the sheaths ovate-elliptic, forming a large ventricose tank, the blades erect, ligulate, attenuate, 30 mm. wide, densely serrate with spreading or recurving spines 5 mm. long, densely pale-lepidote. Scape erect, slender, about equaling the leaves, densely white-tomentellous. Scape-bracts lanceolate, acute, entire, erect, especially the lower ones shorter than the internodes. Inflorescence bipinnate throughout, wholly fertile, cylindric, 20 cm. long, densely tomentellous. Upper primary bracts greatly reduced. Branches spreading, less than 2 cm. long. Floral bracts spreading, spinose-

attenuate from a broadly ovate base, navicular, to 6 mm. long, scarcely if at all adnate to the rhachis. Flowers to 16 mm. long. Sepals strongly asymmetric, mucronate, to 4 mm. long, subfree. Petals acute. Ovary ellipsoid, to 4 mm. long, the epigynous tube distinct, urceolate, the placentae apical, the ovules long-caudate. SANTA CRUZ: Chiquitos: *Weddell* s. n. (P; type).

4. *Ae. Castelnavii* Baker, Handbk. Bromel. 39 (1889). *Ae. Sprucei* Mez in DC. Monog. Phan. 9: 226 (1896). Leaves unknown. Scape straight, stout, ferruginous-furfuraceous toward apex. Scape-bracts reflexed, narrowly ovate, attenuate to a pungent spine, to 20 cm. long, 45 mm. wide, densely serrate with spreading teeth, bright purple, membranaceous. Inflorescence tripinnate, densely subcylindric, 40 cm. long, 75 mm. wide, densely furfuraceous. Lower primary bracts like the scape-bracts, the others greatly reduced. Branches spreading, wholly fertile, divided to apex, about 5-flowered. Floral bracts chiefly spinose from an elliptic base, to 5 mm. long. Flowers to 17 mm. long. Sepals strongly asymmetric, 6 mm. long with a 3 mm. terminal spine, nearly free. Petals rounded, reddish when dry. Stamens included. Ovary slenderly ellipsoid, 8 mm. long, the epigynous tube very short, the placentae apical, the ovules caudate. SANTA CRUZ: PROVINCE [?]: *Castelnau* s. n. (P; type). Brazil, Venezuela, Colombia, Costa Rica.

5. *Ae. tocantina* Baker, Handbk. Bromel. 39 (1889). Flowering 1-2 m. high. Leaves to over 1 m. long, the sheaths broadly elliptic, large, the blades ligulate, subacute and attenuate to a stout spine, 4-10 cm. wide, repand-serrate with straight or slightly curved flat brown spines, glabrous above, covered beneath with minute pale-ferruginous scales. Scape erect, ferruginous-furfuraceous. Scape-bracts imbricate, lance-elliptic, acute, pungent, entire, especially the lower ferruginous-lepidote. Inflorescence subdensely cylindric, bipinnate or at base tripinnate, 17-33 cm. long, 7-8 cm. wide, ferruginous-tomentulose. Lower primary bracts like the scape-bracts, exceeding the branches, the others much smaller, the highest subfiliform, very short. Spikes spreading, laxly 4-8-flowered, to 4 cm. long, wholly fertile, the rhachis nearly straight. Floral bracts distichous, spreading, ovate, mucronate, entire, 5 mm. long, usually shorter than the ovary, nerved, the margins free from the rhachis. Flowers 15 mm. long. Sepals strongly asymmetric, short-mucronate, 5 mm. long, short-connate. Petal-scales fimbriate. Ovary ellipsoid, the epigynous tube short but distinct, the placentae apical, the ovules caudate. BENI: CERCADO MOJOS: Trinidad, Misiones Guarayos, 250 m., *Werdermann* 2464 (MO, S). SANTA CRUZ: CERCADO: El Palmar, 500 m., *Cárdenas* 4649 (US); VALLEGRANDE: Los Monos, *I. S. Nelson* G-228 (US). Brazil, Venezuela, Surinam.

6. *Ae. distichantha* Lem. in Jard. Fleur. 3: t. 269 (1853). Flowering 3-7 dm. high. Leaves 3-10 (-15) dm. long, covered on both sides with a membrane of pale fused scales, the sheaths elliptic or oblong, to

3 dm. long, usually much wider than the blades, the blades ligulate, typically with a broad apex, pungent, 25-80 mm. wide, finely to coarsely serrate. Scape erect, white-flocculose. Scape-bracts densely imbricate, elliptic, attenuate, rose, mostly entire. Inflorescence bipinnate, typically lax or sublax and broadly pyramidal, rose and white-flocculose except the petals. Primary bracts broadly ovate, apiculate, often shorter than the spikes. Spikes subsessile, typically spreading and dense, the lateral ones with 2-12 distichous flowers, the terminal with more and polystichous flowers. Floral bracts pouch-shaped, entire, truncate, mucronulate, about equaling the ovary, thin, nerved. Flowers suberect, 15-29 mm. long. Sepals asymmetric, oblong or subquadrate, mucronulate, 5-13 mm. long, free or short-connate. Petals obtuse, purple or blue, the scales serrate. Stamens included. Ovary short-cylindric or obconic, 4-6 mm. long, the epigynous tube large, crateriform, the placentae subcentral, the ovules acute or obtuse. Not reported from Bolivia. Brazil, Argentina, Paraguay.

6a. *Ae. distichantha* var. *Schlumbergeri* E. Morr. ex Mez in Mart. Fl. Bras. 3(3): 343 (1892). *Ae. involucrata* Rusby of Catalogue. *Ae. involucrifera* Mez of Catalogue. Leaves usually attenuate. Inflorescence dense, elongate, slenderly cylindric or fusiform. Spikes erect, few-flowered. LA PAZ: SUR YUNGAS: Irupana, 1800 m., *Cárdenas* 4378 (US). COCHABAMBA: Province [?]: Monte Punco, *Cárdenas* 5588 (US). SANTA CRUZ: VELASCO: 200 m., *Kuntze* s. n. (NY); VALLE GRANDE: Samaipata, 1800 m., *Cárdenas* 3520 (GH); CHIQUITOS: *Weddell* 3512 (P); Santiago de Chiquitos, 700 m., *Cutler* 7026 (GH). WITHOUT LOCALITY: *Bang* s. n. (NY; type of *Ae. involucrata* Rusby and *Ae. involucrifera* Mez). Brazil, Paraguay, Argentina.

7. *Ae. bromeliifolia* (Rudge) Baker ex Benth. & Hook. f. Gen. Pl. 3: 664 (1883). *Ae. ellipsoidea* Rusby of Catalogue. Flowering 7-9 dm. high. Leaves 12-20 in a tubular rosette, 6-12 dm. long, covered on both sides with a membrane of white fused scales, the sheaths ovate to elliptic-oblong, 1-3 dm. long, the blades ligulate, very variable, attenuate to rounded and apiculate, 4-9 cm. wide, concolorous, laxly serrate with spines to 10 mm. long. Scape erect, stout, densely white-lanate. Scape-bracts lance-ovate, acute, entire, thin, the upper ones densely imbricate. Inflorescence densely spicate, ellipsoid or cylindric, fertile throughout, to 15 cm. long, 3-4 cm. wide, densely white-lanate with only the petals exposed at first. Floral bracts broader than long, truncate, thick, coriaceous, bicarinate, enfolding the ovary, much shorter than the sepals. Sepals suborbicular, emarginate, 7 mm. long, equally short-connate. Petals oblong, emarginate, 15 mm. long, greenish yellow, soon turning black, the scales fimbriate. Ovary tomentose, the placentae apical, the ovules long-caudate. LA PAZ: SUR YUNGAS: basin of Río Bopi, San Bartolomé, Calisaya, 750-900 m., *Krukoff*

10248 (GH, NY); Asunto, 840 m., *White* 633 (NY; type of *Ae. ellipsoidea* Rusby). SANTA CRUZ: CHIQUITOS: Santiago, 640 m., *Cutler* 7035 (GH). Argentina to Central America.

13. *Billbergia* Thunb.

Stemless herbs. Leaves rosulate or fasciculate, the sheaths large, the blades ligulate. Scape erect or arching. Scape-bracts ample, thin. Inflorescence simple, spicate. Sepals unarmed. Petals free, spirally recurved at anthesis (subgenus *Helicodea*), bearing 2 scales at base, the claw elongate, the blade narrow. Stamens exserted at anthesis, free from the petals or nearly so, the pollen grains with longitudinal folds when dry but no pores. Epigynous tube evident, the ovules many.

- a. Sepals narrow, 15-24 mm. long.
 - b. Floral bracts shorter than the ovary; sepals 20-24 mm. long. 1. *B. microlepis*.
 - b. Floral bracts exceeding the ovary and the lowest exceeding the sepals; sepals 15-20 mm. long. 2. *B. Meyeri*.
- a. Sepals broad, 10-12 mm. long; floral bracts shorter than the ovary.
 - c. Ovary slightly or not at all sulcate, wholly white-farinose; floral bracts minute or wanting; petals green. 3. *B. decora*.
 - c. Ovary sulcate with the ridges usually glabrous and dark; floral bracts evident.
 - d. Petals clear yellow throughout. 4. *B. Cardenasii*.
 - d. Petals blue. 5. *B. velascana*.

1. *Billbergia microlepis* L. B. Smith in *Phytologia* 8: 504, t. 3, figs. 3, 4 (1963). Leaves 50-75 cm. long, densely appressed-lepidote on both sides, white-banded beneath; the blades ligulate, subacute, apiculate, 5-7 cm. wide, laxly serrate with flat black spreading teeth 1.5-5 mm. long. Scape slender, decurved, finely pale-lepidote. Scape-bracts elliptic, acute, 13 cm. long. Inflorescence lax, 15 cm. long, the rhachis densely pale-lepidote. Floral bracts broadly ovate, apiculate, the lowest almost equaling the ovary, the others much shorter. Flowers sessile. Sepals subequal, lance-oblong, attenuate, 20-24 mm. long, soon glabrous except at base. Petals over 14 cm. long, greenish when dry. Ovary ellipsoid, sulcate with dark lines against the white indument, 9 mm. high exclusive of the 3 mm. short-cylindric epigynous tube. LA PAZ: LARECAJA: Copacabana, Mapiri, 850-950 m., *Krukoff* 11158 (GH; type).

2. *B. Meyeri* Mez in Engler, *Bot. Jahrb.* 30: 148 (1902). Leaves few in a long tubular rosette, 40-75 cm. long, pale-lepidote and white-banded beneath, the sheaths very large, narrowly elliptic, the blades acute, 35 mm. wide, subaxly serrate with antrorse curved spines 1-2 mm. long. Scape decurved, slender, white-farinose. Scape-bracts large, lanceolate, attenuate, the lower erect and about equaling the

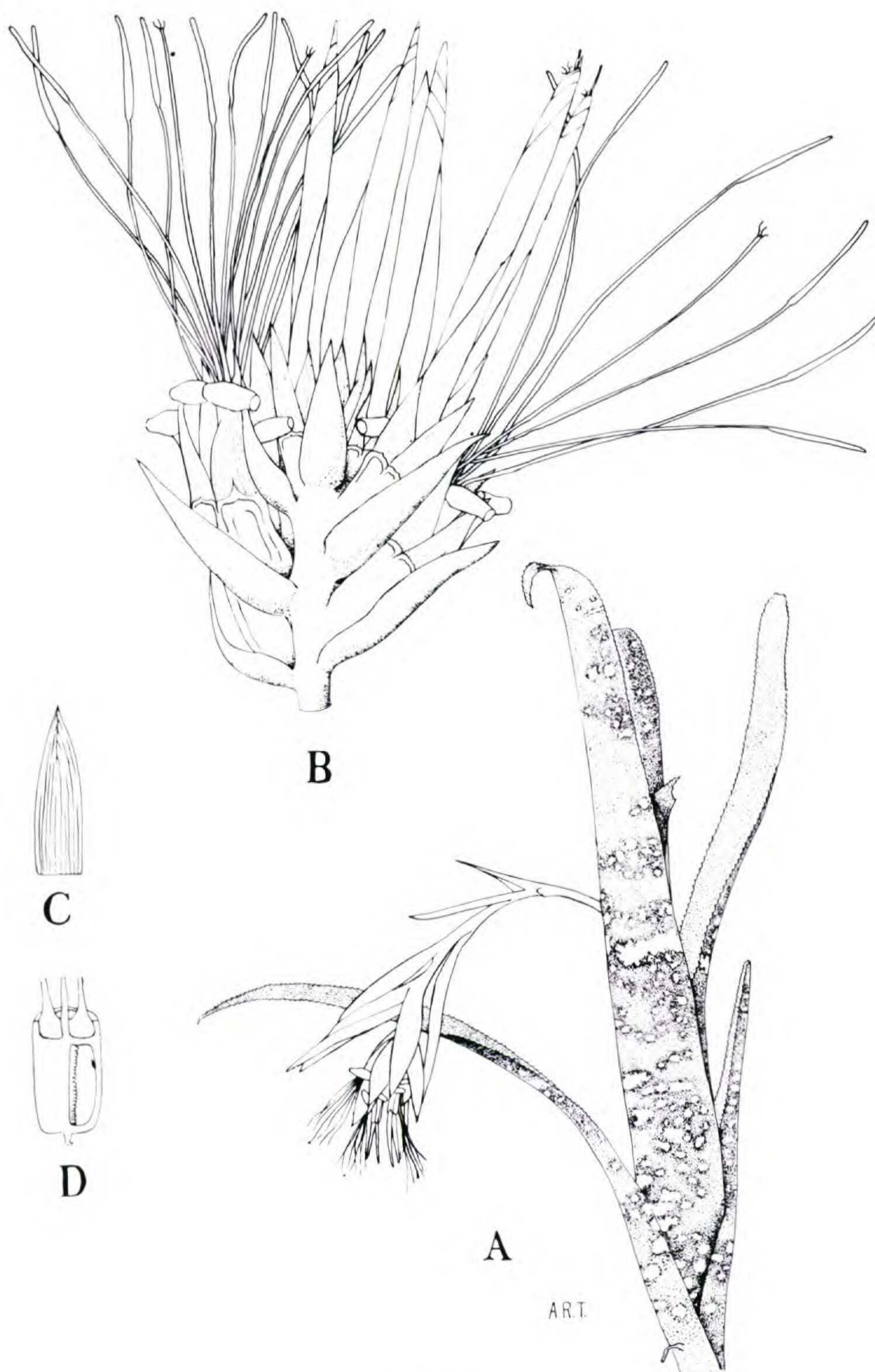


Figure 3.

A: *Billbergia Meyer* (after I. S. Nelson G-35), habit from photo;
B: inflorescence $\times 1$; C: sepal $\times 1$; D: section of ovary $\times 1$.

internodes, the upper divergent and massed beneath the inflorescence. Inflorescence subax, 7-11 cm. long, densely white-farinose except for the petals, the rhachis straight. Floral bracts large, at least exceeding the ovary and the lowest ample and exceeding the sepals, ovate, acute, violet. Flowers divergent. Sepals free, equal, triangular, attenuate, 15-20 mm. long. Petals 45-50 mm. long, green or greenish white, the scales coarsely crenate. Ovary ellipsoid, the epigynous tube 4-5 mm. deep. SANTA CRUZ: CERCADO: Hacienda Sauce, Santa Cruz, I. S. Nelson G-35 (US). Brazil. Fig. 3.

3. **B. decora** Poepp. & Endl. Nov. Gen. & Spec. 2: 42, t. 157 (1838). *B. boliviensis* Baker, Handbk. Bromel. 81 (1889). Leaves few in a tubular or narrowly funnelform rosette, to 7 dm. long, white-banded beneath and sometimes yellow-spotted as well. Blades broadly acute or subrounded and apiculate, to 6 cm. wide, subaxly serrate with stout antrorse spines. Scape decurved, more or less white-farinose. Scape-bracts lanceolate or elliptic, acute, entire, bright rose, the upper ones massed beneath the inflorescence. Inflorescence subax, 10-15 cm. long, densely white-farinose except the petals. Floral bracts minute or lacking. Flowers 9-10 cm. long. Sepals suboblong or broadly ovate, broadly acute and apiculate, to 12 mm. long. Petals wholly green. Ovary ellipsoid, scarcely or not at all sulcate, without spots or dark glabrous lines, the epigynous tube short. LA PAZ: NOR YUNGAS: Unduavi, 2400 m., Rusby 2853 (NY; type of *B. boliviensis* Baker). Brazil, Peru.

4. **B. Cardenasii** L. B. Smith in Phytologia, 4(6): 382 (1953). Leaf-blades broadly acute and apiculate, 4 dm. long, 35 mm. wide, covered on both sides with coarse cinereous appressed scales, laxly serrate with dark curved teeth 2 mm. long. Scape slender, densely and very finely white-flocculose. Scape-bracts lanceolate, acute, 13 cm. long, rose. Inflorescence densely many-flowered, the axis white-flocculose. Floral bracts ovate, acute, shorter than the ovary, membranaceous, glabrous except the base. Sepals equal, ovate, broadly acute, 10 mm. long, thin, nerved, orange, nearly glabrous. Petals 5 cm. long, yellow, the scales denticulate. Ovary ellipsoid, strongly trigonous, 10 mm. long, sulcate, white-flocculose, the epigynous tube small and narrow. COCHABAMBA: CHAPARE: cultivated, probably from Yungas del Chapare, *Cárdenas* 4907 (US; type).

5. **B. velascana** Cárdenas in Bromel. Soc. Bull. 7: 35 (1957). Flowering 6 dm. high. Leaf-blades abruptly acute, 6 dm. long, 2-5 cm. wide, spinulose, gray-green, white-banded. Scape 4 dm. long, 8 mm. thick, densely flocculose. Scape-bracts lanceolate, 16-19 cm. long, rose. Inflorescence many-flowered, the rhachis straight, white-flocculose. Floral bracts ovate, acute, 8 mm. long, membranaceous, rose. Flowers 6-8 cm. long. Sepals lance-ovate, acute, 12 mm. long, green toward base,

violet toward apex, flocculose. Petals 5 cm. long, 6 mm. wide, blue. Ovary ovoid-conical, 12 mm. long, trigonous, sulcate, white-flocculose. SANTA CRUZ: VELASCO: San Ignacio, 500 m., *Hammerschmidt* 5486 in hb. Cárdenas (type).

14. *Pseudananas* Hassler ex Harms

Pseudananas sagenarius (Arruda) Camargo in Rev. Agric. Piracicaba, 14 (7, 8): reprint p. 4 (1939). Caulescent, flowering 1 m. high, propagating by long basal stolons. Stem leafy, straight, 30 cm. high, 5 cm. in diameter. Leaves 30-40, arching, to 12 dm. long, the blades linear, 6-7 cm. wide, deeply channeled, coriaceous, reddish green and lustrous above, densely lepidote beneath, laxly serrate with curved antrorse and retrorse spines 10 mm. long. Scape erect, stout, 2-3 dm. high, furfuraceous. Scape-bracts foliaceous, reduced, reddish. Inflorescence simple, strobilate, ovoid with the apical coma inconspicuous or lacking, 17 cm. long, 9 cm. in diameter, 150-200-flowered. Floral bracts densely imbricate, lanceolate, attenuate, nearly equaling the petals, serrulate, red, cinereous-lepidote, persistent. Flowers connate by their ovaries and forming a syncarp. Sepals asymmetric, ovate, apiculate, 10-13 mm. long, conduplicate or merely channeled, thick with membranous margins, red orange, sparsely lepidote. Petals 4-5 cm. long, the blade lanceolate, purple, the claw bearing lateral folds that overlap the filaments. Stamens included. Syncarp 20 cm. long, succulent. SANTA CRUZ: CHIQUITOS: Puerto Sucre, near Brazilian frontier, *Baker & Collins* s. n. (GH). Brazil, Paraguay.

15. *Ananas* Mill.

Not producing stolons. Leaves densely rosulate, scarcely enlarged at base. Scape evident, erect. Inflorescence densely strobilate, crowned with a tuft of sterile foliaceous bracts, often producing slips at the base. Flowers sessile. Sepals free, obtuse, slightly asymmetric. Petals free, erect, violet or red, each bearing 2 slenderly funnelform scales. Stamens included. Ovaries coalescing with each other and with the bracts and axis to form a fleshy syncarp, the epigynous tube short, the placentae apical, the ovules caudate.

Syncarp 15 cm. long or usually much less, with scant unpalatable flesh at maturity; scape elongate, slender; seeds numerous.

..... 1. *A. ananassoides*.

Syncarp well over 15 cm. long at maturity with copious palatable flesh; scape stout and usually short; seeds lacking or very rare.

..... 2. *A. comosus*.

1. *Ananas ananassoides* (Baker) L. B. Smith in Bot. Mus. Leaflet. Harvard Univ. 7: 79 (1939). Flowering over 1 m. high. Leaves many, more than 16 dm. long, the sheaths densely ferruginous-lepidote, the blades linear, long-attenuate, rarely over 35 mm. wide, subdensely serrate with antrorse spines, green, minutely white-lepidote. Scape

slender, soon glabrous. Scape-bracts large, subfoliaceous. Inflorescence subcylindric, the apical coma small at anthesis but becoming greatly enlarged. Floral bracts broadly elliptic, attenuate, 15-20 mm. long, exceeding the sepals, pungent, serrulate. Sepals broadly elliptic, 7 mm. long. Petals 13-17 mm. long. Fruit slightly enlarged after anthesis, scarcely edible, readily breaking from the scape. Seeds numerous. SANTA CRUZ: CHIQUITOS: Robore, Oriente, 250 m., *Cárdenas* 2929 (GH). Paraguay, Brazil, Venezuela, Colombia.

2. *A. comosus* (L.) Merrill, *Interpr. Rumph. Amboin.* 133 (1917). Leaves coarsely and laxly spinose-serrate. Scape short, stout. Scape-bracts foliaceous, serrate. Inflorescence large, many-flowered. Floral bracts soon exposing the apices of the ovaries, relatively inconspicuous, weakly serrulate or entire. Syncarp well over 15 cm. long at maturity with copious palatable flesh. Seeds lacking or very rare. Tropical lowlands in cultivation but no herbarium specimens. See *Encyclopedia Britannica*, ed. 14, 3: 815 (1929).

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